



JACOBS
UNIVERSITY



Study Program Handbook

Physics

Bachelor of Science

Contents

| | | |
|----------|--|-----------|
| 1 | The Physics Study Program | 1 |
| 1.1 | Concept | 1 |
| 1.2 | Specific Advantages of the Physics Program at Jacobs University | 1 |
| 1.3 | Program-Specific Qualification Aims | 1 |
| 1.4 | The Jacobs University Employability and Personal Development Concept | 2 |
| 1.5 | Career Options | 3 |
| 1.6 | More Information and Contact | 3 |
| 2 | The Curricular Structure | 5 |
| 2.1 | General | 5 |
| 2.2 | The Jacobs University 3C-Model | 5 |
| 2.2.1 | YEAR 1 - CHOICE | 6 |
| 2.2.2 | YEAR 2 - CORE | 6 |
| 2.2.3 | YEAR 3 - CAREER | 6 |
| 2.3 | The Jacobs Track | 9 |
| 2.4 | Modularization of the Physics Program | 10 |
| 2.4.1 | Content | 10 |
| 2.4.2 | Structure | 12 |
| 3 | Appendix 1a/1b: Mandatory Course Plans for World Track and Campus Track | 13 |
| 4 | Appendix 2: Course Data for Program-Specific CHOICE and CORE Courses | 13 |

1 The Physics Study Program

1.1 Concept

Physics has shaped our view of the universe by studying the basic concepts of space, time and matter. Physics not only lays the foundation for other natural sciences and many engineering disciplines, but is also a fundamental part of modern technology. The Jacobs University physics major is a three year BSc program with emphasis on early involvement in research. The first year starts with a broad introduction to classical and modern physics and their mathematical foundations, complemented by a choice of other subjects. The second year of studies features a thorough education in the theoretical foundations of physics (analytical mechanics, electrodynamics, relativity, and quantum mechanics), more applied fields (solid state and statistical physics, semiconductor devices), computational physics and renewable energy. Lectures are complemented by teaching labs and students are encouraged to join a research group. The third year features a varying selection of specialization courses and guided research leading to the BSc thesis. Students have the opportunity to use the fifth semester for an extended internship or studies abroad.

1.2 Specific Advantages of the Physics Program at Jacobs University

- The three year Jacobs University physics BSc program is unique in its internationality and focus on research. The courses are quite advanced, with a difficulty level comparable to other top international programs, providing an ideal preparation for postgraduate studies of physics and related fields at worldwide leading universities.
- Our graduates are very successful in either getting admitted to top postgraduate programs (MSc/PhD) in physics and related fields, directly entering employment, or starting their own businesses. We use the feedback from our graduates to continuously improve our study program and the graduates themselves benefit from our international alumni network.
- For students with a strong interdisciplinary interest the program easily allows to pursue a minor in one of the other BSc programs at Jacobs University in addition to the regular physics major.

1.3 Program-Specific Qualification Aims

Our main objective is a broad and thorough education in physics with many advanced topics and early exposure to research.

- Students will learn the foundations and advanced concepts of classical and modern physics necessary to explain and understand natural phenomena and to develop new materials, technologies, and advance the description and understanding of nature.
- Students will learn a variety of approaches to describe physical systems using a mathematical formalism. They will be able to develop quantitative mathematical descriptions

and computational models to analyze complex systems.

- In lab courses and research projects students will be trained hands-on in advanced experimental methods and techniques in physics to independently design new experiments and evaluate the obtained experimental data.
- Through presentations, lab report preparations, term papers, and the BSc thesis, students will gain familiarity with tools and approaches to access scientific information. They will learn the field-specific terms of physics, and are trained to communicate using the appropriate language of the scientific community.

The analysis of complex systems, logical and quantitative thinking, solid mathematical skills and a broad background in diverse physical phenomena will be a valuable asset for any profession in modern society.

1.4 The Jacobs University Employability and Personal Development Concept

Jacobs University's educational concept aims at fostering employability which refers to skills, capacities, and competencies which transcend disciplinary knowledge and allow graduates to quickly adapt to professional contexts. Jacobs University defines employability as encompassing not just technical skills and understanding but also personal attributes and qualities enabling students to become responsible members of their professional and academic fields as well as of the societies they live in.

Graduates of JU will be equipped with the ability to find employment and to pursue a successful professional career, which means that

- graduates possess the ability to acquire knowledge rapidly, to assess information and to evaluate new concepts critically;
- graduates have communicative competences which allow them to present themselves and their ideas and to negotiate successfully;
- graduates are familiar with business-related processes and management skills and are able to manage projects efficiently and independently.

Graduates of JU will also be equipped with a foundation to become globally responsible citizens, which includes the following attributes and qualities:

- graduates have gained intercultural competence; they are aware of intercultural differences and possess skills to deal with intercultural challenges; they are familiar with the concept of tolerance;
- graduates can apply problem-solving skills in negotiating and mediating between different points of view;

- graduates can rely on basic civic knowledge and have an understanding for ethical reasoning; students are familiar with the requirements for taking on responsibility.

1.5 Career Options

A Jacobs University BSc in Physics provides a solid and at the same time flexible foundation for careers in diverse fields, from basic research over engineering and life sciences, to finance and management. The scientific knowledge, the international network, the problem solving and social skills acquired during the studies of physics at Jacobs University guarantee success in our increasingly technology-driven society, as demonstrated by our many very successful graduates. The physics curriculum at Jacobs University is designed to ensure that graduates will be well prepared for postgraduate programs in physics and related fields at world-wide leading universities. The physics program exceeds recommendations of the German Physical Society and all topics required for the GRE physics test are included.

Physicists are the all-rounders among the natural scientists. About two thirds work on advancing our scientific knowledge or develop new technologies, products, and processes. Research positions are found in research centers, scientific institutes, and universities. In industry, physicists work in the fields like IT, software development, electronics, lasers, optics, and semiconductors. An increasing demand for physicists comes also from medical technology. Another large fraction of physicists hold faculty positions at universities and colleges or work in other branches of education. The broad training in analytical skills, technical thinking and the appreciation of complexity and subtlety allows physicists to work - often with additional qualification - as management consultants, patent attorneys, market analysts, or risk managers. Many BSc degree recipients go on to graduate school in physics and other fields, as careers in research and development usually require a postgraduate degree. Here we have an excellent placement record in the top graduate programs. Very helpful for career development is also the opportunity for international network building with Jacobs University students coming from more than a hundred different nations. Good communication skills are essential, since many physicists work as part of a team, have contact to clients with non-physics background, and need to write research papers and proposals. These skills are particularly well developed in the broad and multidisciplinary undergraduate program at Jacobs University.

1.6 More Information and Contact

For more information please contact the study program coordinator:

Dr. Peter Schupp
Professor of Physics
Email: p.schupp@jacobs-university.de
Telephone: +49 421 200-3224

Dr. Jürgen Fritz

Professor of Biophysics

Email: j.fritz@jacobs-university.de

Telephone: +49 421 200-3522

or visit our program website: www.jacobs-university.de/physics-program

2 The Curricular Structure

2.1 General

The undergraduate education at Jacobs University equips students with the key qualifications necessary for a successful academic, as well as professional career. By combining disciplinary depth and transdisciplinary breadth, supplemented by skills education and extracurricular elements, students are prepared to be responsible and successful citizens within the societies they work and live in.

The curricular structure provides multiple elements enhancing employability, transdisciplinarity, and internationality. The unique Jacobs Track, offered across all study programs, provides a broad range of tailor-made courses designed to foster career competencies. These include courses which promote communication, technology, business, (German) language, and management skills. The World Track, included in the third year of study, provides extended company internships or study abroad options. Thus students gain training on the job and intercultural experiences. All undergraduate programs at Jacobs University are based on a coherently modularized structure, which provides students with a broad and flexible choice of study plans to meet their major as well as minor study interests.

The policies and procedures regulating undergraduate study programs at Jacobs University in general can be found on the website.

2.2 The Jacobs University 3C-Model

Jacobs University offers study programs according to the regulations of the European Higher Education Area. All study programs are structured along the European Credit Transfer System (ECTS), which facilitates credit transfer between academic institutions. The three-year undergraduate program involves six semesters of study with a total of 180 ECTS credits. The curricular structure follows an innovative and student-centered modularization scheme - the 3C-Model - which groups the disciplinary content of the three study years according to overarching themes:

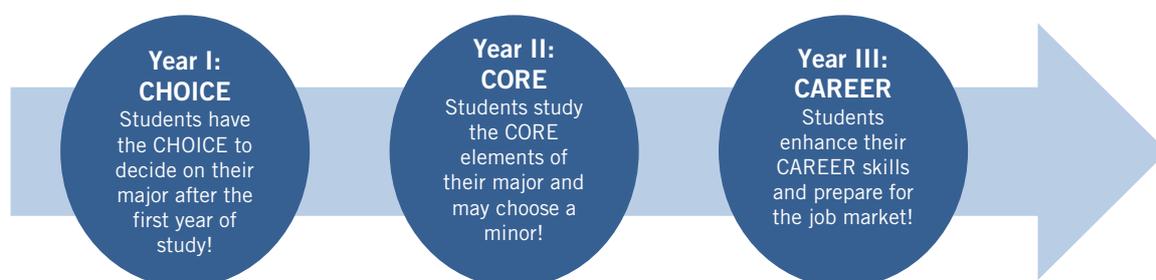


Figure 1: The Jacobs University 3C-Model

2.2.1 YEAR 1 - CHOICE

The first study year is characterized by a broad offer in disciplinary and interdisciplinary education. Students select three CHOICE modules from a variety of study programs. As a unique asset, our curricula allow students to select their study program freely from among the three selected CHOICE modules during their first year of study.

2.2.2 YEAR 2 - CORE

In the second year, students take three in-depth, discipline-specific CORE modules. One CORE module can also be taken from a second, complementary discipline, which allows students to incorporate a minor study track into their undergraduate education. Students will generally qualify for a minor if they have successfully taken at least one CHOICE module and one CORE module in a second field, and this extra qualification will be highlighted in the transcript.

2.2.3 YEAR 3 - CAREER

During their third year, students must decide on their career after graduation. In order to facilitate this decision, the fifth semester introduces two separate tracks. By default students are registered for the World Track.

1. The World Track

In this track there are two mandatory elective options:

- **Internship**

The internship program is a core element of Jacobs University's employability approach. It includes a mandatory semester-long internship off-campus (minimum 16 weeks in full-time) which provides insight into the labor market as well as practical work experience related to the respective area of study. Successful internships may initiate career opportunities for students. For more information, please contact the Career Services Center (<http://www.jacobs-university.de/career-services/contact>).

- **Study Abroad**

Students can take the opportunity to study abroad at one of our partner universities. Courses recognized as study abroad credits need to be pre-approved according to the Jacobs University study abroad procedures and carry minimum of 20 ECTS credits in total. Several exchange programs allow you to be directly enrolled at prestigious partner institutions worldwide. Jacobs University's participation in Erasmus+, the European Union's exchange program, provides an exchange semester at a number of European universities including Erasmus study abroad funding.

For more information, please contact the International Office (<http://intoffice.user.jacobs-university.de/outgoing/>).

2. The Campus Track

Alternatively, students may also opt to follow the Campus Track by continuing their undergraduate education at Jacobs, namely by selecting an additional CORE module during their third year and redistributing the remaining courses and modules across the

third year. This opportunity can be used by students to more intensively focus on their major or to fulfill the minor requirements for a second field of interest.

In the sixth semester, all students select from a range of specialization courses within their study program and concentrate on their Bachelor thesis in the context of a Project/Thesis Module.

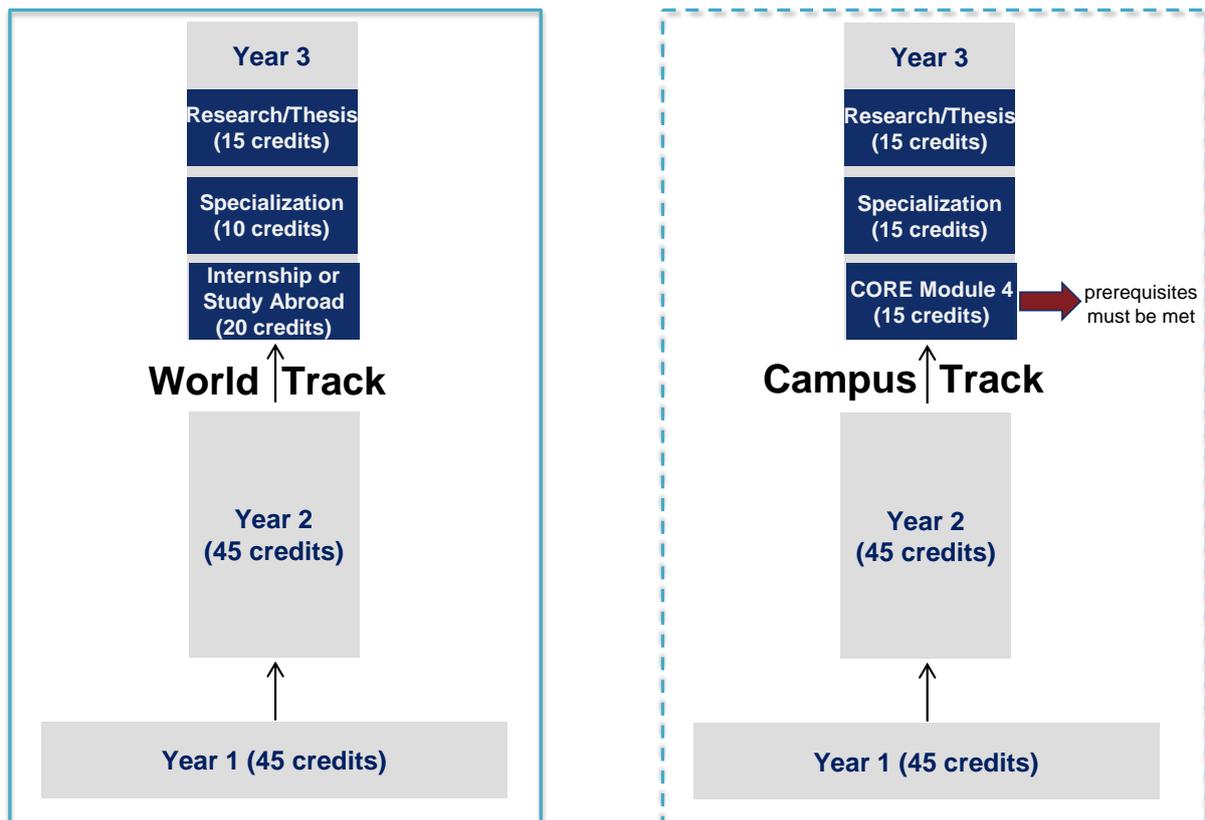


Figure 2: World Track versus Campus Track

Career Skills

Throughout their studies all students attend a mandatory set of career skills courses and events.

The mandatory Career Skills module prepares all undergraduate students at Jacobs University for the transition from student life to working life as well as for their future career. Skills, knowledge and information which are fundamental for participation in an internship or a semester abroad will be conveyed concurrently. Essential components of the module include information sessions, compulsory seminars on various career-relevant topics as well as participation in the annual Jacobs Career Fair.

The successful completion of the Career Skills Module and the encompassed single seminars are graded with Pass/Fail for all students. ECTS credits are not awarded. All undergraduate students will be automatically registered for the Career Skills Module. However, every student has to keep track of his/her individual fulfillment of requirements and has to register on Campusnet for all seminars and sessions during the official registration period at the beginning of each semester. An overview of the sequence in which components should be completed is shown in the table below:

CAREER SKILLS MODULE

| SEMESTER | 1 | 2 | 3 | 4 | 5 | 6 |
|--|---|---|---|---|--|---|
| MANDATORY BASICS | CSC-INFO Session: "CSC Services" CA01-990000 | | CSC-INFO Session: "World Track" CA01-990014 | | | |
| MANDATORY SEMINARS | Both seminars have to be attended in your first or second semester: CSC-APPLICATION TRAINING CA01-990001 CSC-RESEARCHING & CONTACTING EMPLOYERS CA01-990004 | | | | | |
| MANDATORY ELECTIVE SEMINARS (seminar program subject to availability) | | | Attend 2 out of several career skills seminars and workshops. i.e. ▪ Business Etiquette ▪ Presentation Skills ▪ Communication Skills ▪ Grad School Application Training ▪ Self-Management ▪ Time-Management ▪ Decision Making ▪ Preparing for an Interview ▪ Introduction to Project Management | | | |
| OTHER MANDATORY COMPONENTS | | | | CSC-JACOBS CAREER FAIR in February, on campus CA01-990003 | INTERNSHIP or STUDY ABROAD or CAMPUS TRACK | INTERNSHIP & STUDY ABROAD EVENT Online CSC-CAREER SURVEY CA01-990002 |

Figure 3: The Career Skills Module

2.3 The Jacobs Track

The Jacobs Track, another stand-alone feature of Jacobs University, runs parallel to the disciplinary CHOICE, CORE, and CAREER modules across all study years and is an integral part of all study programs. It reflects our commitment to an in-depth methodological education, it fosters our transdisciplinary approach, it enhances employability, and equips students with extra skills desirable in your general field of study. Additionally, it integrates essential language courses.

Mathematics, statistics, and other methods courses are offered to all students within a comprehensive Methods Module. This module provides students with general foundations and transferable techniques which are invaluable to follow the study content not only in the study program itself but also in related fields.

The Skills Module equips students with general academic skills which are indispensable for their chosen area of study. These could be, for example, programming, data handling, presentation skills, and academic writing, scientific and experimental skills.

The transdisciplinary Triangle Module offers courses with a focus on at least one of the areas of business, technology and innovation, and societal context. The offerings comprise essential knowledge of these fields for students from other majors as well as problem-based courses that tackle global challenges from different disciplinary backgrounds. Working together with students from different disciplines and cultural backgrounds in these courses broadens the students horizon by crossing the boundaries of traditional disciplines.

Foreign languages are integrated within the Language Module. Communicative skills and foreign language competence foster students intercultural awareness and enhance their employability in a globalized and interconnected world. Jacobs University supports its students in acquiring and improving these skills by offering a variety of language courses at all proficiency levels. Emphasis is put on fostering German language skills, as they are an important prerequisite for students to learn about, explore, and eventually integrate into their host country. Hence, acquiring 10 ECTS credits in German is a requirement for all students. Students who meet the requirements of the German proficiency level (e.g. native speakers) are required to select courses in any other language program offered.

2.4 Modularization of the Physics Program

2.4.1 Content

Year 1

Take two mandatory modules listed below and select one further CHOICE module from a different study area.

Physics of Natural Systems (CH05-PhysNatSys)

provides an introduction to the physical description of natural phenomena and covers fundamental topics in physics and earth and environmental sciences (EES). Important concepts from mechanics, thermodynamics, fluid dynamics, electromagnetism, atoms and nuclei are introduced and applied to essential processes in Earth, marine, and planetary sciences. Structure and dynamics of natural systems are studied with moderate use of mathematics. Practical sessions will cover important experimental techniques and tools. This module provides a foundation for the higher level EES and Physics modules Earth, Ocean, and Environmental Physics, Physics and Technology, Theoretical Physics, and Physics of Matter.

Physics and Applied Mathematics (CH06-PhysAppMath)

is an introduction to the mathematical description of natural phenomena. Mathematics is the language and physics is the foundation of all other natural sciences and many engineering disciplines. In this module, we will study fundamental laws of physics and the underlying mathematical concepts and applications. Topics include vector calculus, differential equations, complex analysis; mechanics of systems of particles, oscillations, waves, relativity, electrodynamics, and quantum physics. Lectures are complemented by practical sessions that provide training in computational and experimental skills, including a quantitative analysis of measurements.

Year 2

Take all three modules or replace one with a CORE module from a different study program.

Theoretical Foundations of Physics (CO15-TheoPhys)

The module provides a thorough overview of the theoretical foundations of physics. We will study the physics of particles, fields and quanta, while exploring the mathematical structure of nature. The module covers several core topics of physics, including analytical mechanics, electrodynamics, special relativity, and quantum mechanics. Additional lab courses give deeper insights into the systems discussed in the lectures and provide instructive examples in advanced physics.

Physics of Matter (CO13-PhysMatter)

The module provides an introduction to the physics of systems of many interacting particles. In the first part, classical thermodynamics is introduced and extended to a microscopic statistical description of many particle systems. The second part focuses on the physics of solid materials, their electronic and magnetic properties, different modes of excitations and applications especially in modern electronics and information technology. Additional lab courses give deeper insights into the systems discussed in the lectures and provide instructive examples of experiments in advanced physics.

Physics and Technology (CO14-PhysTech)

The module discusses advanced applications of physics in modern technology using a descriptive and experimental approach. It builds on the general concepts and methods developed in the Physics of Natural Sciences Module. The first part focuses on energy sources and energy storage technology, and includes pertinent concepts of thermodynamics and physical chemistry. The second part introduces computational simulation methods as an important tool, useful for the understanding and investigation of physical systems and for a speed up of the development of new technologies. Additional lab courses give deeper insights into the systems discussed in the lectures and provide instructive examples of experiments in advanced physics.

Some CORE Modules require students to have taken a specific CHOICE Module. Please see the Module Handbook for details regarding pre-requisites.

Year 3

In the 3rd year students follow the World Track by default:

1. World Track

5th Semester

- Internship / study abroad

6th Semester

- Physics Project / Thesis Module
- Program-specific Specialization Module
Exemplary course offering:
 - Advanced Quantum Physics
 - Biophysics
 - Computer Simulations with Biomedical Applications
 - Gravity, Cosmology and Black Holes
 - Laser Spectroscopy in Physical and Life Sciences
 - Nanoscience
 - Particles and Fields
 - Physics of Information Technology

2. Campus Track

Students who do not enter the World Track follow the Campus Track.

5th and 6th Semester

- Program-specific Project / Thesis Module
- Program-specific Specialization Module
(please see World Track for exemplary course offering)
- Additional CORE Module

2.4.2 Structure

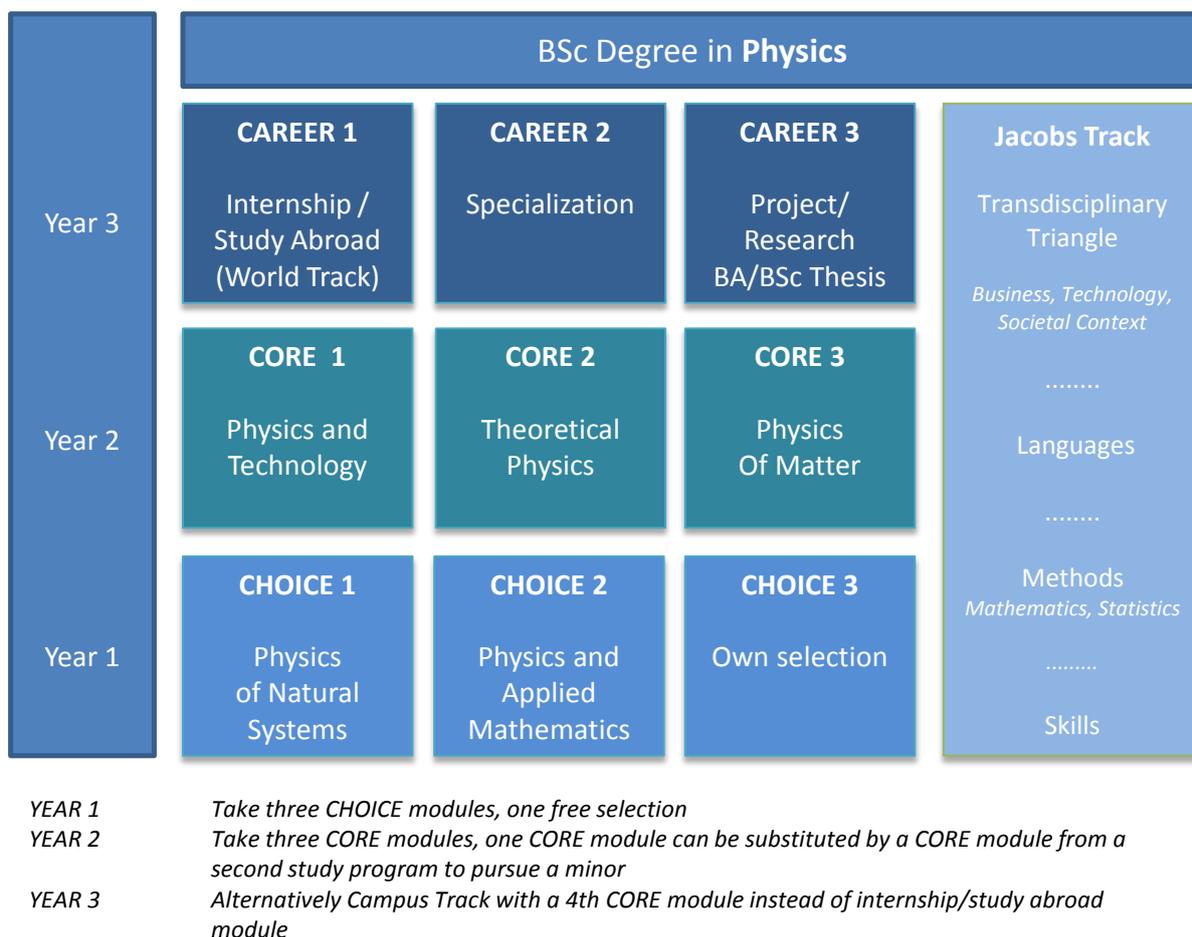


Figure 4: Physics Module Structure

3 Appendix 1a/1b: Mandatory Course Plans for World Track and Campus Track

Jacobs University Bremen reserves the right to substitute courses by replacements and/or reduce the number of mandatory/mandatory elective courses offered.

4 Appendix 2: Course Data for Program-Specific CHOICE and CORE Courses

All course data stated in the appendix is based on the previous study year and subject to change.

Appendix 1a - Mandatory Course Plan for World Track

| Physics – World Track | | | | | | | | | | | |
|--|---|----------|---------|-----------|---|---|------------------------------------|---------|------------|-----------|-----|
| Matriculation Fall 2016 | | | | | | | | | | | |
| Program-Specific Modules | | | | | Jacobs Track Modules (General Education) | | | | | | |
| Type | Status ¹ | Semester | Credits | | | | | | | | |
| Year 1 - CHOICE | | | | 45 | | | | | | 20 | |
| <i>Take the two mandatory CHOICE modules listed below, these are a requirement for the Physics program.</i> | | | | | | | | | | | |
| CH06-PhysAppMath Module: Physics and Applied Mathematics | | | | | JT-ME-MethodsMath Module: Methods / Mathematics | | | | | | |
| CH06-100101 | Applied Mathematics | Lecture | m | 1 | 5 | JT-ME-120103 | Calculus I | Lecture | m | 1 | 2,5 |
| CH06-100111 | Applied Mathematics Lab | Lab | m | 1 | 2,5 | JT-ME-120104 | Calculus II | Lecture | m | 1 | 2,5 |
| CH06-200102 | Modern Physics | Lecture | m | 2 | 5 | JT-ME-120112 | Foundations of Linear Algebra I | Lecture | m | 2 | 2,5 |
| CH06-200112 | Modern Physics Lab | Lab | m | 2 | 2,5 | JT-ME-120113 | Foundations of Linear Algebra II | Lecture | m | 2 | 2,5 |
| CH05-PhysNatSys Module: Physics of Natural Systems | | | | | JT-SK-Skills Module: Skills | | | | | | |
| CH05-200104 | Classical Physics | Lecture | m | 1 | 5 | JT-SK-990103 | Scientific and Experimental Skills | Lecture | m | 1 | 2,5 |
| CH05-200114 | Classical Physics Lab | Lab | m | 1 | 2,5 | JT-TA-TriArea Module: Triangle Area | | | | | |
| CH05-210132 | Introduction to Earth and Marine Systems | Lecture | m | 2 | 5 | Take one course from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS ³ | | | | | |
| CH05-210133 | Introduction to Mineralogy | Lab | m | 2 | 2,5 | JT-LA-Language Module: Language | | | | | |
| Module: CHOICE (own selection) | | | | | Module: CHOICE (own selection) | | | | | | |
| | | | | | e | | | | | 1/2 | 15 |
| <i>Students take one further CHOICE module from those offered for all other study programs. ²</i> | | | | | | | | | | | |
| Year 2 - CORE | | | | 45 | | | | | | 20 | |
| <i>Take all three modules or replace one with a CORE module from a different study program. ²</i> | | | | | | | | | | | |
| CO13-PhysMatter Module: Physics of Matter | | | | | JT-ME-MethodsMath Module: Methods / Mathematics | | | | | | |
| CO13-200212 | Statistical Physics | Lecture | m | 3 | 5 | Take two Methods (mandatory) elective courses (2,5 ECTS each). ² | | | | | |
| CO13-200311 | Condensed Matter and Devices | Lecture | m | 4 | 5 | Lecture | me | 3/4 | 5 | | |
| CO13-200222 | Physics of Matter - Advanced Lab | Lab | m | 4 | 5 | JT-TA-TriArea Module: Triangle Area | | | | | |
| CO14-PhysTech Module: Physics and Technology | | | | | Module: Triangle Area | | | | | | |
| CO14-201231 | Renewable Energy | Lecture | m | 3 | 5 | Take four courses from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS ³ | | | | | |
| CO14-200221 | Renewable Energy - Advanced Lab | Lab | m | 3 | 5 | JT-LA-Language Module: Language | | | | | |
| CO14-200331 | Introduction to Computer Simulation Methods | Lecture | m | 4 | 5 | Take two German courses (2,5 ECTS each). Seminar | | | | | |
| CO15-TheoPhys Module: Theoretical Physics | | | | | Module: Language | | | | | | |
| CO15-200201 | Analytical Mechanics & Electrodynamics | Lecture | m | 3 | 5 | Native German speakers take courses in another offered language | | | | | |
| CO15-200223 | Theoretical Physics - Advanced Lab | Lab | m | 4 | 5 | | | | | | |
| CO15-200202 | Quantum Mechanics | Lecture | m | 4 | 5 | | | | | | |
| Year 3 - CAREER | | | | 45 | | | | | | 5 | |
| CA02 / CA03 Module: Internship / Study Abroad | | | | | JT-SK-Skills Module: Skills | | | | | | |
| m | | | | | m | | | | | | |
| 5 | | | | | 6 | | | | | | |
| 20 | | | | | 2,5 | | | | | | |
| CA01-CarSkills Module: Career Skills | | | | | JT-SK-990103 Advanced Scientific and Experimental Skills | | | | | | |
| m | | | | | m | | | | | | |
| 6 | | | | | 6 | | | | | | |
| 10 | | | | | 2,5 | | | | | | |
| CA08-PHY Module: Project/Thesis PHY | | | | | JT-TA-TriArea Module: Triangle Area | | | | | | |
| CA08-200303 | Project PHY | m | m | 6 | 5 | Take one course from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS ³ | | | | | |
| CA08-200304 | Thesis PHY | m | m | 6 | 10 | | | | | | |
| CA-S-PHY Module: Specialization Area PHY | | | | | | | | | | | |
| m | | | | | me | | | | | | |
| 10 | | | | | 5/6 | | | | | | |
| 10 | | | | | 10 | | | | | | |
| Total ECTS | | | | | | | | | | | |
| | | | | | | | | | 180 | | |

¹ Status (m = mandatory, e = elective, me = mandatory elective)

² For a full listing of all CHOICE / CORE / CAREER / Jacobs Track modules please consult the **CampusNet online catalogue** and / or the module handbook (on our website).

³ You are required to take six Triangle Area courses in total. Select two from each of the three triangle areas (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT).

Appendix 1b - Mandatory Course Plan for Campus Track

| Physics – Campus Track | | | | | | | | | | | |
|--|---|----------|---------|---|---|---|------------------------------------|---------|---|------------|-----------|
| Matriculation Fall 2016 | | | | | | | | | | | |
| Program-Specific Modules | | | | | Jacobs Track Modules (General Education) | | | | | | |
| Type | Status ¹ | Semester | Credits | | Type | Status ¹ | Semester | Credits | | | |
| Year 1 - CHOICE | | | | | 45 | | | | | 20 | |
| <i>Take the two mandatory CHOICE modules listed below, these are a requirement for the Physics program.</i> | | | | | | | | | | | |
| CH06-PhysAppMath Module: Physics and Applied Mathematics | | | | | JT-ME-MethodsMath Module: Methods / Mathematics | | | | | 10 | |
| CH06-100101 | Applied Mathematics | Lecture | m | 1 | 5 | JT-ME-120103 | Calculus I | Lecture | m | 1 | 2,5 |
| CH06-100111 | Applied Mathematics Lab | Lab | m | 1 | 2,5 | JT-ME-120104 | Calculus II | Lecture | m | 1 | 2,5 |
| CH06-200102 | Modern Physics | Lecture | m | 2 | 5 | JT-ME-120112 | Foundations of Linear Algebra I | Lecture | m | 2 | 2,5 |
| CH06-200112 | Modern Physics Lab | Lab | m | 2 | 2,5 | JT-ME-120113 | Foundations of Linear Algebra II | Lecture | m | 2 | 2,5 |
| CH05-PhysNatSys Module: Physics of Natural Systems | | | | | JT-SK-Skills Module: Skills | | | | | 2,5 | |
| CH05-200104 | Classical Physics | Lecture | m | 1 | 5 | JT-SK-990103 | Scientific and Experimental Skills | Lecture | m | 1 | 2,5 |
| CH05-200114 | Classical Physics Lab | Lab | m | 1 | 2,5 | JT-TA-TriArea Module: Triangle Area | | | | | |
| CH05-210132 | Introduction to Earth and Marine Systems | Lecture | m | 2 | 5 | Take one course from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS ³ | | | | | |
| CH05-210133 | Introduction to Mineralogy | Lab | m | 2 | 2,5 | JT-LA-Language Module: Language | | | | | |
| Module: CHOICE (own selection) | | | | | e | | | | | 1/2 | 15 |
| <i>Students take one further CHOICE module from those offered for all other study programs. ²</i> | | | | | | | | | | | |
| Year 2 - CORE | | | | | 45 | | | | | 20 | |
| <i>Take all three modules or replace one with a CORE module from a different study program. ²</i> | | | | | | | | | | | |
| CO13-PhysMatter Module: Physics of Matter | | | | | JT-ME-MethodsMath Module: Methods / Mathematics | | | | | 5 | |
| CO13-200212 | Statistical Physics | Lecture | m | 3 | 5 | Take two Methods (mandatory) elective courses (2,5 ECTS each). ² | | | | | |
| CO13-200311 | Condensed Matter and Devices | Lecture | m | 4 | 5 | Lecture me 3/4 5 | | | | | |
| CO13-200222 | Physics of Matter - Advanced Lab | Lab | m | 4 | 5 | JT-TA-TriArea Module: Triangle Area | | | | | |
| CO14-PhysTech Module: Physics and Technology | | | | | me | | | | | 15 | |
| CO14-201231 | Renewable Energy | Lecture | m | 3 | 5 | Take four courses from the triangle (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT) area. Each counts 2,5 ECTS ³ | | | | | |
| CO14-200221 | Renewable Energy - Advanced Lab | Lab | m | 3 | 5 | JT-LA-Language Module: Language | | | | | |
| CO14-200331 | Introduction to Computer Simulation Methods | Lecture | m | 4 | 5 | Take two German courses (2,5 ECTS each). Seminar me 3/4 5 | | | | | |
| CO15-TheoPhys Module: Theoretical Physics | | | | | me | | | | | 15 | |
| CO15-200201 | Analytical Mechanics & Electrodynamics | Lecture | m | 3 | 5 | Native German speakers take courses in another offered language | | | | | |
| CO15-200223 | Theoretical Physics - Advanced Lab | Lab | m | 4 | 5 | | | | | | |
| CO15-200202 | Quantum Mechanics | Lecture | m | 4 | 5 | | | | | | |
| Year 3 - CAREER | | | | | 45 | | | | | 5 | |
| COXX Module: Additional (4th) CORE module | | | | | m | | | | | 5/6 | 15 |
| CA01-CarSkills Module: Career Skills | | | | | m | | | | | 15 | |
| CA08-PHY Module: Project/Thesis PHY | | | | | m | | | | | 15 | |
| CA08-200303 | Project PHY | m | m | 5 | 5 | JT-SK-Skills Module: Skills | | | | | |
| CA08-200304 | Thesis PHY | m | m | 6 | 10 | JT-SK-990103 Advanced Scientific and Experimental Skills m 6 2,5 | | | | | |
| CA-S-PHY Module: Specialization Area PHY | | | | | m | | | | | 15 | |
| Take six specialization courses (2.5 ECTS each) ² | | | | | me | | | | | 5/6 | 15 |
| Total ECTS | | | | | | | | | | 180 | |

¹ Status (m = mandatory, e = elective, me = mandatory elective)

² For a full listing of all CHOICE / CORE / CAREER / Jacobs Track modules please consult the **CampusNet online catalogue** and / or the module handbook (on our website).

³ You are required to take six Triangle Area courses in total. Select two from each of the three triangle areas (BUSINESS, TECHNOLOGY & INNOVATION, SOCIETAL CONTEXT).

Appendix 2 - Course Data

| Course Name Classical Physics | Course No CH05-200104 | ECTS 5 | | | | | | | | |
|---|-------------------------------------|--|------|-----------|------------|-----|-----------|-----|--------------|-----|
| Module Affiliation CH05-PhysNatSys Physics of Natural Systems | Workload (hrs / sem) 125 | Level Bachelor 1st Year CHOICE | | | | | | | | |
| <p>Course Description / Content / Aims</p> <p>Physics is the most fundamental of all natural sciences. A thorough background and understanding of physics is important for any description of natural systems. This course introduces to the basic principles of mechanics, thermodynamics, and optics. Emphasis is laid on general principles and fundamental concepts for the understanding of natural phenomena, not on an extensive mathematical description. Nevertheless, some basic calculus will be necessary to develop a scientific sound description of physical phenomena. Experiments and demonstrations are included in the lecture, and a tutorial is offered to discuss homework and topics of interest in more details.</p> <p>The course consists of three main sections: The section on mechanics introduces the description of motion and the concepts of force and energy, including collisions, rotations, gravitation, and oscillations. The section on thermodynamics adds the concepts of heat and temperature to the description of natural systems including heat capacity, ideal gases, internal energy and the first law of thermodynamics. The section on optics introduces the concepts of light rays and waves to discuss optical instruments and the phenomena of interference and diffraction.</p> | | | | | | | | | | |
| <p>Methods of Assessment</p> <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">Name</th> <th style="text-align: right;">Weighting</th> </tr> </thead> <tbody> <tr> <td>Final Exam</td> <td style="text-align: right;">50%</td> </tr> <tr> <td>Home Work</td> <td style="text-align: right;">20%</td> </tr> <tr> <td>Midterm Exam</td> <td style="text-align: right;">30%</td> </tr> </tbody> </table> | | | Name | Weighting | Final Exam | 50% | Home Work | 20% | Midterm Exam | 30% |
| Name | Weighting | | | | | | | | | |
| Final Exam | 50% | | | | | | | | | |
| Home Work | 20% | | | | | | | | | |
| Midterm Exam | 30% | | | | | | | | | |
| Course Name Classical Physics Lab | Course No CH05-200114 | ECTS 2,5 | | | | | | | | |
| Module Affiliation CH05-PhysNatSys Physics of Natural Systems | Workload (hrs / sem) 62,5 | Level Bachelor 1st Year CHOICE | | | | | | | | |
| <p>Course Description / Content / Aims</p> <p>Physics is an experimental science and the ultimate test for any theory or description of nature is the experiment. This lab course complements the Classical Physics lecture with experiments in the fields of mechanics, thermodynamics and optics. It deepens the understanding and extends the topics covered in the lecture, which is a corequisite for this course. Prior to the course, students need to attend the relevant safety instructions and will get an introduction into error analysis and calculation. The lab offers six different experiments and runs over six afternoons. The aim of the lab sessions is hands-on experience on how to investigate physical phenomena and topics presented in the lecture; to plan, carry out, and analyse experiments in physics; to describe, summarize and present experimental results adequately. Examples of experiments include the mathematical pendulum, ideal gas law and optical instruments.</p> | | | | | | | | | | |
| <p>Methods of Assessment</p> <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">Name</th> <th style="text-align: right;">Weighting</th> </tr> </thead> <tbody> <tr> <td>Final Exam</td> <td style="text-align: right;">34%</td> </tr> <tr> <td>Reports</td> <td style="text-align: right;">66%</td> </tr> </tbody> </table> | | | Name | Weighting | Final Exam | 34% | Reports | 66% | | |
| Name | Weighting | | | | | | | | | |
| Final Exam | 34% | | | | | | | | | |
| Reports | 66% | | | | | | | | | |

Appendix 2 - Course Data

| | | |
|--|-------------------------------------|--|
| Course Name Introduction to Earth and Marine Systems | Course No CH05-210132 | ECTS 5 |
| Module Affiliation CH05-PhysNatSys Physics of Natural Systems | Workload (hrs / sem) 125 | Level Bachelor 1st Year CHOICE |
| Course Description / Content / Aims Planet Earth is a natural system comprising a number of compartments such as the interior, the continents, the oceans, and the atmosphere. In this course you are introduced to the complex interplay of earth and marine processes on a wide range of spatial and temporal scales. Earth's history and planetary evolution define our place in space and time. Plate tectonics and surface structures are closely linked to the composition and the dynamics of the planetary interior. We discuss the physical forces and hydrodynamical principles on our rotating planet that govern ocean currents and also atmospheric dynamics on large spatial scales. | | |
| Methods of Assessment | | |
| Name | | Weighting |
| Exam Oceanography (Prof. Thomsen) | | 34% |
| Exam Planet Earth (Prof. Vogt) | | 33% |
| Exam Solid Earth (Prof. Unnithan) | | 33% |
| Course Name Introduction to Mineralogy | Course No CH05-210133 | ECTS 2,5 |
| Module Affiliation CH05-PhysNatSys Physics of Natural Systems | Workload (hrs / sem) 62,5 | Level Bachelor 1st Year CHOICE |
| Course Description / Content / Aims This course provides an introduction to mineral sciences. Key concepts of crystallography are reviewed to show how the three-dimensional nature of crystals is related to their physical and chemical properties. An introduction to modern analytical techniques like e.g. XRD is given. Further topics include nucleation and growth of crystals from aqueous solutions, and their thermodynamic properties. | | |
| | | |
| | | |

Appendix 2 - Course Data

| | | |
|--|------------------------------------|--|
| Course Name Applied Mathematics | Course No CH06-100101 | ECTS 5 |
| Module Affiliation CH06-PhysAppMath Physics and Applied Mathematics | Workload (hrs / sem) 125 | Level Bachelor 1st Year CHOICE |
| Course Description / Content / Aims Mathematics is the language of physics and an indispensable tool with applications in all sciences, engineering, economy and many other aspects of human society. This course provides an introduction to applied mathematics with focus on applied analysis, vector calculus and differential equations. Applications in physics and other natural sciences are discussed in detail. Topics: review of single variable differentiation and integration; ordinary differential equations, equations of motion, damped and driven oscillations, RLC circuits; Fourier transform; systems of particles, systems in equilibrium (statics), 2-body central force problem; introduction to vectors, matrices, eigenvalues and eigenvectors; spacetime isometries, time-dependent rotations, angular momentum, tensor of inertia, and principal axes; vector calculus, gradient, curl, divergence; partial differential equations, wave equation, Schrödinger equation, Maxwell's equations. | | |
| Methods of Assessment | | |
| Name | | Weighting |
| Final Exam | | 40% |
| Home Work | | 20% |
| Midterm Exam | | 20% |
| Quizz(es) | | 20% |
| Course Name Applied Mathematics Lab | | |
| Course No CH06-100111 | | |
| ECTS 2,5 | | |
| Module Affiliation CH06-PhysAppMath Physics and Applied Mathematics | | |
| Workload (hrs / sem) 62,5 | | |
| Level Bachelor 1st Year CHOICE | | |
| Course Description / Content / Aims This lab complements the lectures on Applied Mathematics and provides a practical introduction to programming, numerical and/or symbolic computation with many examples. | | |
| Methods of Assessment | | |
| Name | | Weighting |
| Attendance and Active Participation | | 20% |
| Computer Assignments | | 40% |
| Theory Quizzes | | 40% |

Appendix 2 - Course Data

| | | |
|---|-------------------------------------|--|
| Course Name Modern Physics | Course No CH06-200102 | ECTS 5 |
| Module Affiliation CH06-PhysAppMath Physics and Applied Mathematics | Workload (hrs / sem) 125 | Level Bachelor 1st Year CHOICE |
| <p>Course Description / Content / Aims</p> <p>Modern technology and the understanding of natural systems is heavily based on electromagnetic phenomena and the physics of the 20th century. This course introduces the basic principles and phenomena of electromagnetism and modern physics. Emphasis is laid on the understanding of general principles and phenomena supported by an adequate mathematical description. Experiments and demonstrations are included in the lecture, and a tutorial is offered to discuss homeworks and topics of interest in more detail.</p> <p>The course consists of two main sections: The electromagnetism part is an introduction to basic electric and magnetic phenomena using the concepts of force, fields, and potentials. This is followed by a discussion of dielectrics and magnetism in matter, electric currents, induction, and Maxwell equations.</p> <p>In the modern physics part new concepts from relativity and quantum physics are introduced to describe properties and interactions of particles. This includes a discussion of the particle nature of light and the wave-like nature of particles, Schrödinger's equation, energy levels of atoms, spin, molecules and solids, nuclear physics, elementary particles and the standard model of particle physics.</p> | | |
| | | |
| | | |
| Course Name Modern Physics Lab | Course No CH06-200112 | ECTS 2,5 |
| Module Affiliation CH06-PhysAppMath Physics and Applied Mathematics | Workload (hrs / sem) 62,5 | Level Bachelor 1st Year CHOICE |
| <p>Course Description / Content / Aims</p> <p>Physics is an experimental science and the ultimate test of any theory or description of nature is the experiment. This lab course complements the Modern Physics lecture course with experiments in the fields of electromagnetism and modern physics. It deepens the understanding and extends the topics covered in the lecture, which is a corequisite for this course. This course builds on the Classical Physics lab course, but it can also be taken independently. Prior to the course, students need to attend the relevant safety instructions and will get an introduction to error analysis. The lab offers six different experiments and runs over six afternoons.</p> <p>The aim of the lab sessions is hands-on experience on how to investigate physical phenomena and topics presented in the lecture; to plan, carry out, and analyse experiments in physics; to describe, summarize and present experimental results adequately. Examples of experiments include Coulomb force, Franck-Hertz experiment, and radioactivity.</p> | | |
| | | |
| | | |

Appendix 2 - Course Data



| | | |
|--|------------------------------------|--|
| Course Name Statistical Physics | Course No CO13-200212 | ECTS 5 |
| Module Affiliation CO13-PhysMatter Physics of Matter | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE |
| Course Description / Content / Aims Statistical physics describes macroscopic properties of matter by a statistical treatment of their microscopic constituents and can be applied in different fields ranging from biophysics to condensed matter and high energy physics. This course deals with an intensive introduction to statistical physics and its applications in condensed matter theory. The course starts with an introduction to the mathematical concepts followed by a very brief review of the thermodynamic concepts and quantities. Topics in statistical physics include the statistical basis of thermodynamics, micro-canonical, canonical and grand-canonical ensembles, macroscopic variables, physical applications up to an introduction to quantum statistical physics like Fermi and Bose quantum gases, and related physical phenomena. Based on the multi-particle wave functions of Fermions, applications in condensed matter physics are discussed, including Bloch wave functions and the density of states. | | |
| Methods of Assessment | | |
| Name | Weighting | |
| Final Exam | 45% | |
| Home Work | 20% | |
| Midterm Exam | 35% | |
| Course Name Physics of Matter - Advanced Lab | Course No CO13-200222 | ECTS 5 |
| Module Affiliation CO13-PhysMatter Physics of Matter | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE |
| Course Description / Content / Aims This second year physics lab course offers advanced experiments related to statistical and condensed matter physics. It deepens the understanding, but also extends or introduces the topics taught in the lectures of the Physics of Matter module. It requires previous exposure to a physics-related first year lab course and its related experimental methods and analysis. Participants carry out six experiments with each experiment occupying two afternoons. The labs purpose is to deepen the experimental skills of students by introducing advanced experimental and evaluation methods. Examples of experiments include the Hall effect, Nd:YAG laser, electron spin and NMR. | | |
| | | |
| | | |

Appendix 2 - Course Data



| | | |
|---|------------------------------------|--|
| Course Name Condensed Matter and Devices | Course No CO13-200311 | ECTS 5 |
| Module Affiliation CO13-PhysMatter Physics of Matter | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE |
| Course Description / Content / Aims Technological progress and the development of new materials or new devices is strongly based on a detailed description and understanding of the physics of matter. This course provides a thorough introduction to condensed matter and solid state physics. Topics include different forms of condensed matter, crystal types, and crystal structures. Based on classical and quantum mechanical Bose-Fermi statistics the concepts of density-functional theory, the models by Drude and Sommerfeld, Fermi sphere, cohesive energy, classical and quantum harmonic crystal, phonons and quasiparticles are introduced; as well as structure and dynamics of solids, band theory and electronic properties, optical properties, magnetism, and superconductivity. Working principles of important semiconductor devices are explained, including transistors, LED's, solid-state lasers and solar cells. | | |
| | | |
| Course Name Renewable Energy - Advanced Lab | Course No CO14-200221 | ECTS 5 |
| Module Affiliation CO14-PhysTech Physics and Technology | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE |
| Course Description / Content / Aims This second year physics lab course offers advanced experiments related to thermodynamics and renewable energy topics. It deepens the understanding, but also extends or introduces the topics covered in the Renewable Energy lecture. Previous exposure to a first year lab course and the related experimental analysis methods is recommended when taking this lab. Participants carry out six experiments with each experiment occupying two afternoons. The lab will introduce students to advanced experimental and evaluation methods in physics. Examples of experiments include wind tunnel, Stirling engine, and fuel cell. | | |
| Methods of Assessment | | |
| Name | | Weighting |
| Final Exam (oral) | | 20% |
| Report | | 80% |

Appendix 2 - Course Data



| Course Name Renewable Energy | Course No CO14-201231 | ECTS 5 | | | | | | | | | | |
|--|------------------------------------|--|------|-----------|-----------|-----|------------|-----|--------------|-----|-----------|-----|
| Module Affiliation CO14-PhysTech Physics and Technology | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE | | | | | | | | | | |
| <p>Course Description / Content / Aims</p> <p>Renewable energy resources promise to provide clean, decentralized solutions to the world energy crisis, as energy resources which directly depend on the power of the sun's radiation. The course gives an overview of the potential and limitations of energy resources. It includes a self-contained introduction to classical thermodynamics. We start with an overview of energy scenarios based on current energy needs and available energy resources. After an introduction to the basic physics of solar energy and the basics of thermodynamics we cover physics and engineering aspects of solar cells, solar thermal collectors, wind power, geothermal power, thermophotovoltaics, the potential of biomass energy resources, hydro, tidal and wave energy. A basic introduction to energy transport and energy storage is given. We also give an introduction to the basic physics of other energy resources, in particular nuclear energy.</p> | | | | | | | | | | | | |
| <p>Methods of Assessment</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Name</th> <th style="text-align: right;">Weighting</th> </tr> </thead> <tbody> <tr> <td>Exercises</td> <td style="text-align: right;">20%</td> </tr> <tr> <td>Final Exam</td> <td style="text-align: right;">30%</td> </tr> <tr> <td>Midterm Exam</td> <td style="text-align: right;">30%</td> </tr> <tr> <td>Quizz(es)</td> <td style="text-align: right;">20%</td> </tr> </tbody> </table> | | | Name | Weighting | Exercises | 20% | Final Exam | 30% | Midterm Exam | 30% | Quizz(es) | 20% |
| Name | Weighting | | | | | | | | | | | |
| Exercises | 20% | | | | | | | | | | | |
| Final Exam | 30% | | | | | | | | | | | |
| Midterm Exam | 30% | | | | | | | | | | | |
| Quizz(es) | 20% | | | | | | | | | | | |
| Course Name Introduction to Computer Simulation Methods | Course No CO14-200331 | ECTS 5 | | | | | | | | | | |
| Module Affiliation CO14-PhysTech Physics and Technology | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE | | | | | | | | | | |
| <p>Course Description / Content / Aims</p> <p>This introductory course on Computer Simulation Methods discusses a number of practical numerical solutions for typical problems in the natural sciences. While, for example, the very nature of physics is the expression of relationships between physical quantities in mathematical terms, an analytic solution of the resulting equations is often not available. Instead, numerical solutions based on computer programs are required to obtain useful results for real-life problems. In this course several numerical techniques are introduced, such as solving differential equations of motion, partial differential equations, random number generation and standard as well as Monte Carlo integration, which are important tools in any numerical approach. These methods will be applied to a selection of problems including the classical dynamics of particles, traffic simulations, simple electrostatics, random processes, cellular automata, etc. Since the course includes numerous examples and exercises for programming codes, some programming skills in C, Fortran or Python are strongly recommended as prerequisites.</p> | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Appendix 2 - Course Data



| | | |
|---|------------------------------------|--|
| Course Name Analytical Mechanics & Electrodynamics | Course No CO15-200201 | ECTS 5 |
| Module Affiliation CO15-TheoPhys Theoretical Physics | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE |
| Course Description / Content / Aims Mechanics provides the foundation for all other fields of physics. The analytical techniques developed in mechanics have applications in many other sciences, engineering and even economics. Electrodynamics is the prototype theory for all forces of nature. It plays a profound role in all modern communication, computing and control systems, as well as energy production, transport, storage and use. This course provides an intensive calculus-based introduction to analytical mechanics, special relativity and electrodynamics. Topics include: Systems of particles, rigid body mechanics, Lagrangian mechanics, variational techniques, symmetries and conservation laws, Hamiltonian mechanics, small oscillations; relativistic mechanics; electromagnetic fields, Maxwell's equations, electrostatics, magnetostatics, electromagnetic radiation. The course is part of the core physics education and builds in an essential way on the foundation laid by the Physics and Applied Mathematics module. The course is however also accessible and of interest to students without this prerequisite, but with a sufficiently strong background in mathematics. | | |
| Methods of Assessment | | |
| Name | Weighting | |
| Final Grade | 100% | |
| Course Name Quantum Mechanics | Course No CO15-200202 | ECTS 5 |
| Module Affiliation CO15-TheoPhys Theoretical Physics | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE |
| Course Description / Content / Aims At a fundamental microscopic level our world is governed by quantum phenomena that frequently defy attempts of a common sense understanding based on our everyday experience of the macroscopic world. Yet modern technology would not be possible without quantum physics. This course provides an intensive introduction to quantum mechanics. We shall emphasize conceptual as well as quantitative aspects of the theory. Topics include: Foundation and postulates of quantum mechanics; Schrödinger Equation; one-dimensional problems (potential barriers and tunneling); operators, matrices, states (Dirac notation, representations); uncertainty relations; harmonic oscillator, coherent states; angular momentum and spin; central potential (hydrogen atom, multi-electron atoms); perturbation theory; mixed states, entanglement, measurement. Some illustrative examples from quantum information theory (quantum computing) will be discussed. The course is part of the core physics education and is also of interest for students of other natural sciences and mathematics. | | |
| | | |
| | | |

Appendix 2 - Course Data



| | | |
|--|------------------------------------|--|
| Course Name Theoretical Physics - Advanced Lab | Course No CO15-200223 | ECTS 5 |
| Module Affiliation CO15-TheoPhys Theoretical Physics | Workload (hrs / sem) 125 | Level Bachelor 2nd Year CORE |
| Course Description / Content / Aims This second year physics lab course offers advanced experiments related to analytical mechanics, electromagnetism, and atomic physics. It deepens the understanding, but also extends or introduces the topics covered in the lectures of the Theoretical Physics Module. It requires previous exposure to a physics-related first year lab course and its related experimental methods and analysis. Participants carry out six experiments with each experiment occupying two afternoons. Students expand their experimental skills by gaining practical experience with advanced experimental and evaluation methods. Examples of experiments include gyroscope and Coriolis force, Stern Gerlach experiment, and diffraction and dispersion. | | |
| | | |
| | | |