Swiss International
Institute Lausanne

BACHELOR OF SCIENCE IN PHYSICS

The outlined program is designed to provide students with unique knowledge in general physics. It builds upon the foundational work of giants in theoretical physics such as Isaac Newton, James Clerk Maxwell, Albert Einstein, Niels Bohr, Erwin Schrödinger, Lev Landau, Richard Feynman, and others. Experimentally, the program incorporates a tailored virtual lab experience optimized for online engagement, offering both a full-scale virtual environment and remote control of real laboratory equipment.

The program begins by establishing a solid mathematical foundation essential for understanding fundamental physics theories and methods. It then continues with a unique collection of physics courses, complemented by classes designed to equip students with the skills needed to become competitive, world-class researchers. The international faculty at the Physics Department consists of leading research scientists from some of the most renowned research institutions worldwide.

Students who successfully complete the program are expected to be highly competitive candidates for top American and European graduate programs in physics. Alternatively, their research careers may lead them to positions in prestigious institutes, laboratories, private research firms, and consulting companies. Additionally, we anticipate that some of our top graduates will leverage their research expertise to develop innovative ideas and eventually establish their own high-tech startups.

Language of instruction/examination: English

Official duration: 8 semesters (4 years)

ECTS: 240 ECTS, 30 of which for Bachelor thesis research and writing

Degree awarded: Bachelor of Science in Physics

COURSES

Courses in the Bachelor of Science in Physics program include Core Classes (192 ECTS), Elective Classes (18 ECTS), and a Bachelor Thesis (30 ECTS), which involves conducting original research during the final three semesters.

Elective classes allow students to customize their education based on their career goals. Options include a tailored preparation program in physical education and sports for those interested in developing not only intellectually, but also physically and in maintaining a healthy lifestyle, as well as GRE preparation for students pursuing an academic path. Alternatively, students aiming for a career in entrepreneurship can choose to develop strong foundations in Management and Marketing. This track is further supported by a series of professional certificates, including:

1. Professional Certificate in Fundamentals of Project Management
2. Professional Certificate in Product Management
3. Professional Certificate in Leadership Essentials
4. Program Management and the Art of Communication
5. Professional Certificate in Marketing Strategy
6. XSeries Program in Business Principles and Entrepreneurial Thought

Aims of the Program

Provide students with fundamental knowledge in Physics across several key disciplines to lay the foundation for future Master's or PhD studies and/or to equip them with the skills and expertise required to meet the growing demands of the global technology industry, which increasingly needs technical experts with practical, hands-on experience. Introduce students to real-world laboratory environments, both small- and large-scale. Build skills for both individual and team-based research activities. Provide students with a solid understanding of computer-based platforms and tools, which are essential for contemporary numerical modeling in physics research and industry. Develop strong communication and presentation skills. Prepare students for competitive admission to graduate programs at leading European and North American universities. Equip students with sufficient knowledge and technical competencies to secure entry-level positions in the rapidly growing technology market.

LEARNING OUTCOMES

Developing mathematical apparatus and thinking essential for understanding physics formalism:

This outcome focuses on forming a fundamental basis of knowledge in mathematical analysis, linear algebra, and analytical geometry, essential for a comprehensive understanding of physical theories and models.

Forming fundamental knowledge in general physics:

After completing the program, students must demonstrate a solid understanding of classical mechanics, electromagnetism, thermodynamics, quantum mechanics, and statistical physics at the undergraduate level.

Developing scientific and analytical skills:

This outcome aims to develop scientific and analytical skills that enable students to independently solve physical problems using theoretical models and quantitative reasoning, as well as to use approximations and dimensional analysis.

Computational and Data Analysis Skills:

This outcome targets the development of essential programming skills and an understanding of basic algorithms, enabling students to apply numerical methods to model physical systems and to analyze experimental data. Upon completing the program, students should be comfortable using common software (e.g., MATLAB, Python, Octave) and dedicated simulation tools for modeling and visualizing physical processes.

Communication and Teamwork:

This learning outcome focuses on developing communication skills that allow students to convey scientific ideas clearly in written, oral, and visual forms to both expert and non-expert audiences. It also aims to enable students to work effectively in collaborative team environments and contribute to interdisciplinary and complex research projects.

Ethics:

This outcome builds a foundation for understanding ethics in physics research and technology. It enables students to recognize their rights and responsibilities regarding authorship when research is conducted collaboratively. It also helps them understand the role of physics in addressing global challenges and in setting meaningful priorities when choosing research directions. Additionally, students will learn how to ethically base their research on prior work, including proper citation of original sources, and gain awareness of which research methods are ethically acceptable, and which are not.

	Course	ECTS	Assessment
	SEMESTER 1	30	
MATH101	Mathematical Analysis I	6	HW/Midterm W/ Final O
MATH102	Analytical Geometry	3	HW/ Final W
MATH103	Linear Algebra I	3	HW/Midterm O/ Final W
HISP101	History of Physics	3	Final O
PHYS101	Classical Mechanics I	6	HW/Midterm W/ Final O
ACRE101	Academic Research I	4	HW
COMP101	Computer Science I	3	HW/ Final W
SPOR101 or MANG101	Sport and Physical Education I or **EdX course block:** 1. Introduction to Project Management 2. Risk Management for Projects 3. Product Management Fundamentals 4. Achieving Product-Market Fit	2	HW or EDX Exam

	Course	ECTS	Assessment
	SEMESTER 2	30	
MATH111	Mathematical Analysis II	6	HW/Midterm O/ Final W
MATH113	Linear Algebra II	3	HW/ Final O
PHIL111	Philosophy I	3	HW/ Final O
PHYS111	Classical Mechanics II	6	HW/Midterm O/ Final W
ACRE111	Academic Research II	4	HW/ Final W
PHYS112	Quantum Mechanics I	3	HW/Midterm W/ Final O
COMP111	Computer Science II	3	HW/ Final W
SPOR111 or MANG111	Sport and Physical Education I or **EdX course block:** 1. Product Design, Prototyping, and Testing 2. Data Science and Agile Systems for Product Management 3. Modern Product Leadership 4. Critical Thinking & Problem Solving	2	HW or EDX Exam

	Course	ECTS	Assessment
	SEMESTER 3	30	
MATH201	Mathematical Physics I	6	HW/Midterm W/ Final O
MATH202	Statistics and Probability Theory	3	HW/Midterm O/ Final W
PHYS203	Electromagnetism I	3	HW/Midterm O/ Final W
PHYL201	Philosophy II	3	Midterm W/ Final O
PHYS202	Quantum Mechanics II	6	HW/Midterm W/ Final O
ACRE201	Academic Research III	4	HW
COMP201	Computer Science III	3	HW/ Final W
SPOR201 or MANG201	Sport and Physical Education I or **EdX course block:** 1. Business Communication 2. Teamwork & Collaboration 3. Effective Communication for Program and Project Stakeholders and Teams	2	HW or EDX Exam

	Course	ECTS	Assessment
	SEMESTER 4	30	
MATH211	Mathematical Physics II	6	HW/Midterm W/ Final O
PHYS214	Thermodynamics and Statistical Physics I	6	HW/Midterm O/ Final W
PHYS213	Electromagnetism II	3	Midterm W/ Final O
ACRE211	Academic Research IV	3	HW/Midterm W/ Final O
PHYS212	Quantum Mechanics III	6	HW
COMP211	Computational Methods in Physics I	3	HW/ Final W
ETHI211 or MANG211	Ethics I or **EdX course block:** 1. Persuasion and Presence for Program and Project Managers 2. Managing Conflicts on Projects with Cultural and Emotional Intelligence 3. Designing Project Information Hubs for Program and Project Performance	3	HW or EDX Exam

	Course	ECTS	Assessment
	SEMESTER 5	**30**	
PHYS303	Electrodynamics I	6	Midterm W/ Final O
PHYS304	Thermodynamics and Statistical Physics II	3	HW/Midterm O/ Final W
PHYS305	Nuclear and Atomic Physics I	3	HW/Midterm O/ Final W
PHYS306	Optics and Laser Physics I	3	Midterm W/ Final O
PHYS307	Special Relativity I	3	HW/Midterm W/ Final O
ACRE301	Academic Research IV	6	HW
COMP301	Computational Methods in Physics II	3	HW/ Final W
GREP301 or MARK301	GRE preparation I or **EdX course block:** 1. Storytelling That Delivers Program and Project Outcomes 2. Public Speaking 3. Customer Centric Marketing for Entrepreneurs	3	HW or EDX Exam

	Course	ECTS	Assessment
	SEMESTER 6	**30**	
PHYS313	Electrodynamics II	6	Midterm W/ Final O
PHYS315	Nuclear and Atomic Physics II	3	HW/Midterm O/ Final W
PHYS316	Optics and Laser Physics II	3	Midterm W/ Final O
PHYS317	Special Relativity II	6	HW/Midterm W/ Final O
BATH311	Bachelor Thesis Research I	6	HW
COMP311	Computational Methods in Physics III	3	HW/ Final W
GREP311 or MARK311	GRE PREPARATION II or **EdX course block:** 1. Financial Accounting Made Fun: Eliminating Your Fears 2. The Entrepreneurial Mindset 3. Financial Analysis for Decision Making	3	HW or EDX Exam

	SEMESTER 7	**30**	
PHYS407	General Relativity I	6	HW/Midterm W/ Final O
PHYS316	Optics and Laser Physics III	3	Midterm W/ Final O
PHYS408	Theory of Waves and Oscillations I	3	HW/Midterm W/ Final O
PHYS400	Accelerator Physics I	3	HW/Midterm W/ Final O
PHYS405	High Energy Physics I	3	HW/Midterm W/ Final O
BATH401	Bachelor Thesis Research II	9	HW
PHYS409 or MARK401	Solid State Physics or **EdX course block:** 1. Marketing Fundamentals: Who Is Your Customer? 2. Analytics for Decision Making 3. Digital Strategy and Action	3	HW or EDX Exam

	SEMESTER 8	**30**	
PHYS417	General Relativity II	6	HW/Midterm W/ Final O
PHYS418	Theory of Waves and Oscillations II	3	HW/Midterm W/ Final O
PHYS410	Accelerator Physics II	3	HW/Midterm W/ Final O
PHYS415	High Energy Physics II	3	HW/Midterm W/ Final O
BATH411	Bachelor Thesis Research III	15	HW

HW=Homework assignment, **Midterm W**=Written Midterm exam approximately in the middle of the semester, **Final O**=Final Oral examination