

Department of Physics

Applied Physics

I. Introduction

Applied physics is a discipline which aims at the applications of the laws of physics for developing new technologies, new functional materials, and solving some particular engineering problems. In the past century, breakthroughs in theoretical physics have triggered revolutions in modern industries, such as nuclear energy, semiconductor, superconductor, laser, aviation and aerospace, etc. At present, physics plays a great role in economy and our daily life. While in the future, progresses in areas like fusion energy, new energy materials, high temperature superconductivity, metamaterials and quantum information are expected. It is then a big challenge to transfer the latest achievements in physics to technologies and practical applications.

Southern University of Science and Technology is located in Shenzhen city which is one of the most developed areas in China. There are numbers of high-tech enterprises in the city which bring pressing needs for original innovation of technology and high-level R&D technicians and engineers. Applied physics serves as a bridge between physics and other majors like chemistry, materials science and engineering, electrical and electronic engineering, etc., in SUSTech, providing a training program of the above needs, and a platform for developing new technologies.

II. Objectives

Through the applied physics program, students acquire basic physics knowledge and experimental techniques, basic engineering knowledge in other majors like material science and electrical and electronic engineering, the ability to innovate, and interdisciplinary collaboration. The students are also required to master one or two computer languages. After graduation, students can pursue higher degree in related fields, teach in schools, or conduct R&D in the electronic or material industries.

III. Period of Study and Degree Requirement

Time length: 4 years

Degree conferred: Bachelor of Science

The minimum credit requirement for graduation: 148.5 credits

IV. Discipline

Applied Physics

V. Main Courses

General Physics, Mathematical Methods in Physics, Analytical Mechanics, Electrodynamics I, Thermodynamics and Statistical Physics I, Introduction to Quantum Mechanics, Modern Optics, Introduction to Solid State Physics, Digital Circuit, Analog Circuit, Semiconductor Physics and Devices, Laser Fundamentals etc.

VI. Practice - Based Courses

See Table 3.

VII. Course Structure and Credit Requirements

General Education (GE) Required Courses: 66.5 credits;

General Education (GE) Elective Courses: 10 credits;

Major Foundational Courses: 34 credits;

Major Core Courses: 17 credits;

Major Elective Courses: 9 credits;

Research Projects, Undergraduate Thesis, and Internship: 12 credits;

The minimum credit requirement for graduation: 148.5 credits.

VIII. Course Arrangement

Table 1: Major Required Course (Foundational and Core Courses)

Course Category	Course Code	Course Name	Credit	Experiment Credit	Weekly Credit Hours	Semester (Fall/Spring/Summer)	Recommended Academic year and Semester	Teaching Language	Pre-required Course	Department
Foundational Courses	ME102	CAD 与工程制图 CAD Engineering Design	3	1	4	Spr. & Fall	1/Spr.	Chinese		Department of Mechanics and Energy Engineering
	PHY201-15	综合物理实验 Physics Laboratory II	2	2	4	Fall	2/Fall	Chinese	高等数学上 (GE101), 大学物理 A 上 (PHY101A) 或大学物理 B 上 (PHY101B) Calculus I (GE101), General Physics A (I) (PHY101A) or General Physics B (I) (PHY101B)	Department of Physics
	PHY203-15	数学物理方法 Mathematical Methods in Physics	4		4	Fall	2/Fall	Chinese and English	高等数学上、下 (GE101 和 GE102) 大学物理 A 上、下 (PHY101A 和 PHY102A), 线性代数 I (GE103b) Calculus I (GE101), Calculus II (GE102), General Physics A (I) (PHY101A), General Physics A (II) (PHY102A), Linear Algebra I (GE103b)	Department of Physics
	PHY205-15	分析力学 Analytical Mechanics	3		3	Fall	2/Fall	Chinese	高等数学上、下 (GE101 和 GE102), 大学物理 A 上、下 (PHY101A 和 PHY102A), 线性代数 I (GE103b) Calculus I (GE101), Calculus II (GE102), General Physics A (I) (PHY101A), General Physics A (II) (PHY102A), Linear Algebra I (GE103b)	Department of Physics

	PHY207-15	电动力学 I Electrodynamics I	3		3	Fall	2/Fall	Chinese	高等数学上、下 (GE101 和 GE102), 大学物理 A 下 (PHY102A), 线性代数 I (GE103b), 数学物理方法 (PHY203-15, 可同时选修) Calculus I (GE101), Calculus II (GE102), General Physics A (II) (PHY102A), Linear Algebra I (GE103b), Mathematical Methods in Physics (PHY203-15, selecting at the same semester is acceptable)	Department of Physics
	EE201-15	模拟电路 Analog Circuit	4	1	5	Fall	2/Fall	Chinese	高等数学上、下 (GE101 和 GE102), 线性代数 I & (GE103b, MA104b), 大学物理 A 或 B 上、下 (PHY101A、PHY102A 或 PHY101B、PHY102B), 电路基础 (EE104) Calculus I&II (GE101, GE102), Linear Algebra &II (GE103b, MA104b), Physics A or B (I) & (II) (PHY101A&PHY102A or PHY101B&PHY102B), Fundamentals of Electric Circuits(EE104)	Department of Electrical and Electronic Engineering
	EE202-15	数字电路 Digital Circuit	4	1	5	Spr.	2/Spr.	Chinese	固态电子学 (EE203), 模拟电路 (EE201-15) Solid-state Electronics (EE203), Analog Circuit (EE201-15)	Department of Electrical and Electronic Engineering
	PHY202	现代物理技术实验 Physics Laboratory III	2	2	4	Spr.	2/Spr.	Chinese	高等数学上 (GE101), 大学物理 A 上 (PHY101A) 或大学物理 B 上 (PHY101B) Calculus I (GE101), General Physics A (I) (PHY101A) or General Physics B (I) (PHY101B)	Department of Physics
	PHY204	热力学与统计物理 I Thermodynamics and Statistical Physics I	3		3	Spr.	2/Spr.	Chinese and English	高等数学上、下 (GE101 和 GE102), 大学物理 A 上、下 (PHY101A 和 PHY102A) Calculus I&II (GE101, GE102), General Physics A (I) & (II) (PHY101A, PHY102A)	Department of Physics
	PHY206-15	量子力学 I Introduction to Quantum Mechanics	3		3	Spr.	2/Spr.	Chinese	分析力学 (PHY205-15) Analytical Mechanics (PHY205-15)	Department of Physics

	PHY210	原子物理学 Atomic Physics	3		3	Spr.	2/Spr.	English	大学物理 A 上、下 (PHY101A 和 PHY102A) General Physics A (I) (PHY101A), General Physics A (II) (PHY102A)	Department of Physics
	Summation 合计		34	7	41					
Core Courses	PHY301	研究型物理实验 Physics Laboratory IV	3	3	6	Fall	3/Fall	Chinese	高等数学上 (GE101), 大学物理 A 上 (PHY101A) 或大学物理 B 上 (PHY101B) Calculus I (GE101), General Physics A (I) (PHY101A) or General Physics B (I) (PHY101B)	Department of Physics Department of Physics
	PHY321-15	固体物理 Introduction to Solid State Physics	4		4	Fall	3/Fall	Chinese and English	量子力学 I (PHY206-15) Introduction to Quantum Mechanics (PHY206-15)	Department of Physics
	PHY307	近代光学 Modern Optics	3		3	Fall	3/Fall	Chinese and English	大学物理 A 上、下 (PHY101A 和 PHY102A) General Physics A (I) (PHY101A), General Physics A (II) (PHY102A)	Department of Physics
	PHY324	激光原理 Laser Fundamentals	3		3	Spr.	3/Spr.	Chinese	近代光学 (PHY307), 原子物理学 (PHY210) Modern Optics (PHY307), Atomic Physics (PHY210)	Department of Physics
	PHY326-15	半导体物理与器件 Semiconductor Physics and Devices	4		4	Spr.	3/Spring	Chinese and English	固体物理 (PHY321-15), 数学物理方法 (PHY203-15) Introduction to Solid State Physics (PHY321-15), Mathematical Methods in Physics (PHY203-15)	Department of Physics
	Total		17	3	20					

Table 2: Major Elective Courses

Course Code	Course Name	Credit	Experiment Credit	Weekly Credit Hours	Semester (Fall/Spring/Summer)	Recommended Academic year and Semester	Teaching Language	Pre-required Course	Department
MA104b	线性代数 II Linear Algebra II	4		4	Spr.	1/ Spr.	Chinese/English, or both Chinese and English	线性代数 I (GE103b) Linear Algebra (GE103b)	Department of Mathematics
PHYS001	基础物理开放实验 Open Physics Laboratory I	1	1	2	Smr.	1/ Summer	Chinese	高等数学上 (GE101), 大学物理 A 上 (PHY101A) 或大学物理 B 上 (PHY101B) Calculus I (GE101), General Physics A (I) (PHY101A) or General Physics B (I) (PHY101B)	Department of Physics
PHY221	综合物理开放实验 Open Physics Laboratory II	1	1	2	Fall	2/Fall	Chinese	高等数学上 (GE101), 大学物理 A 上 (PHY101A) 或大学物理 B 上 (PHY101B) Calculus I (GE101), General Physics A (I) (PHY101A) or General Physics B (I) (PHY101B)	Department of Physics
MA212	概率论与数理统计 Probability and Mathematical Statistics	3		3	Spr. & Fall	2/ Fall	Chinese or English	高等数学上、下 (GE101 和 GE102), 线性代数 I (GE103b) Calculus I (GE101), Calculus II (GE102), Linear Algebra I (GE103b)	Department of Mathematics
MA202	复变函数 Complex Analysis	3		3	Spr.	2/ Spr.	Chinese and English	数学分析 I& II&III (MA101a, MA102a, MA103a), 或高等数学上&下 (GE101 和 GE102); 线性代数 I Mathematical Analysis I & II & III	Department of Mathematics

								(MA101a,MA102a,MA103a), or Calculus I & II (GE101, GE102); Linear Algebra I (GE103b)	
PHY208	电动力学 II Electrodynamics II	3		3	Spr.	2/ Spr.	Chinese	电动力学 I (PHY207-15) Electrodynamics I (PHY207-15)	Department of Physics
PHY305	量子力学 II Quantum Mechanics II	3		3	Fall	3/Fall	Chinese	量子力学 I (PHY206-15) Introduction to Quantum Mechanics (PHY206-15)	Department of Physics
MA305	数值分析 Numerical Analysis	3		3	Fall	3/Fall	Chinese	数学分析 I& II & III (MA101a, MA102a, MA103a), 或高等数学 上&下 (GE101 和 GE102); 线性 代数 I&II Mathematical Analysis I & II & III (MA101a,MA102a,MA103a), or Calculus I & II (GE101, GE102); Linear Algebra I&II (GE103b, MA104b)	Department of Mathematics
PHY303	统计物理 II Statistical Mechanics II	3		3	Fall	3/Fall	Chinese and English	热力学与统计物理 I (PHY204) Thermodynamics and Statistical Physics I (PHY204)	Department of Physics
GE3131	文献检索和科技写作 Literature Search and Writing in Science and Technology	1		1	Fall	3/Fall	Chinese		
PHY322	科研软件选讲 Lectures on Selected Research Software	2		2	Spr.	3/ Spr.	Chinese	计算机程序设计基础 (GE105), 大学物理 A 上、下 (PHY101A 和 PHY102A), 高等数学上、下 (GE101 和 GE102) Basics of Computer Programming Design (GE105), General Physics A (I) (PHY101A), General Physics A (II) (PHY102A), Calculus I (GE101), Calculus II (GE102)	Department of Physics
PHY328	低温物理学	3	1	4	Spr.	3/ Spr.	Chinese and	热力学与统计物理 I (PHY204)	Department of

	Low Temperature Physics						English	Thermodynamics and Statistical Physics I (PHY204)	Physics
PHY330	固体光电子学 Solid Optoelectronics	3		3	Spr.	3/ Spr.	English	量子力学 I (PHY206-15), 近代光学 (PHY307) Introduction to Quantum Mechanics (PHY206-15), Modern Optics (PHY307)	Department of Physics
PHY332-15	表面物理 Surface Physics	4		4	Spr.	3/ Spr.	Chinese and English	固体物理 (PHY321-15) Introduction to Solid State Physics(PHY321-15)	Department of Physics
PHY334	固体理论导论 Introduction to Solid State Theory	4		4	Spr.	3/ Spr.	Chinese	固体物理 (PHY321-15) Introduction to Solid State Physics(PHY321-15)	Department of Physics
PHY336	计算物理 Introduction to Computational Physics	3		3	Spr.	3/ Spr.	Chinese	计算机程序设计基础 (GE105), 数值分析 (MA305), 热力学与统计物理 I (PHY204), 固体物理 (PHY321-15) Basics of Computer Programming Design (GE105), Numerical Analysis (MA305), Thermodynamics and Statistical Physics I (PHY204), Introduction to Solid State Physics(PHY321-15)	Department of Physics
PHYS002	物理学前沿问题选讲 Lectures on Selected Frontiers Physics	2		2	Smr	3/ Smr	Chinese	大学物理 A 上、下 (PHY101A 和 PHY102A) General Physics A (I) (PHY101A), General Physics A (II) (PHY102A)	Department of Physics
PHYS003	物理学中的数值算法 Numerical Algorithms in Physics	1		1	Smr.	3/ Smr.	Chinese	固体物理 (PHY321-15), 数值分析 (MA305) Introduction to Solid State Physics(PHY321-15), Numerical Analysis (MA305)	Department of Physics
PHYS004	光合作用和分子晶体中的能量传输	1		1	Smr.	3/ Smr.	Chinese		Department of Physics

	Energy transfer in photosynthesis and molecular crystals								
PHY423-15	薄膜物理 Physics of Thin Films	3		3	Fall	4/Fall	English	固体物理（PHY321-15），热力学与统计物理 I（PHY204） Introduction to Solid State Physics(PHY321-15), Thermodynamics and Statistical Physics I (PHY204)	Department of Physics
PHY425	现代材料分析技术 Modern Techniques in Materials Characterization	3	1	4	Fall	4/Fall	Chinese and English	量子力学 I（PHY206-15） Introduction to Quantum Mechanics (PHY206-15)	Department of Physics
PHY427	微纳结构加工 Introduction to Microelectronic fabrication	2	1	3	Fall	4/Fall	Chinese and English	化学原理（CH101） 半导体物理与器件（PHY326-15） General Chemistry (CH101), Semiconductor Physics and Devices (PHY326-15)	Department of Physics
PHY429	先进电子显微学 Advanced Electron Microscopy	3	1	4	Fall	4/Fall	Chinese and English	固体物理（PHY321-15） Introduction to Solid State Physics(PHY321-15)	Department of Physics
Total		59	6	65					

Annotation 1: Students should report their schemes of major elective courses before the second week, the first term of the third academic year after confirming with their academic advisors. The minimum credit requirement of major elective course is 24.

Annotation 2: The courses whose course codes start with PHYS are summer semester courses. They may change depending on the situation.

Annotation 3: Major elective courses of specific semesters may be changed according to the situation. New Major elective courses may be opened and are not included in the table. Please pay attention to the course plan of corresponding department at beginning of each semester.

Table 3: Overview of Practice-Based Courses

Course Code	Course Name	Credit	Experiment Credit	Weekly Credit Hours	Semester (Fall/Spring/Summer)	Recommended Academic year and Semester	Teaching Language	Pre-required Course	Department
PHY480	科技创新项目 Research Projects	2	2	4					Department of Physics
PHY485	工业实习* Internship*	2	2	4					Department of Physics
PHY490	毕业论文（设计） Undergraduate Thesis/Projects	8	8	16					Department of Physics
Total		12	12	24					
Annotation 1: Students are recommended to carry out the internship in the summer semester of the third academic year by registering for the corresponding courses from Department of Electrical and Electronic Engineering or Department of Materials Science and Engineering, and finish the courses under the corresponding requirements.									

Table 4: Overview of Course Hours and Credits

Course Category	Total Course Hours	Total Credits	The Minimum Credit Requirement
General Education (GE) Required Courses	1168	66.5	66.5
General Education (GE) Elective Courses	3144	182.5	10
Major Foundational Courses	656	34	34
Major Core Courses	320	17	17
Major Elective Courses	1040	59	9
Undergraduate Thesis/ Projects, Research Projects, Internship	about 384	12	12
Total	6712	371	148.5
Annotation 1: The total credit hours are calculated based on 16 weeks per semester..			