

# 应用物理

## 一、培养目标

通过物理学思维、物理学研究方法以及光电子科学与工程技术的系统训练，培养学生具备坚实宽广的物理学和光电子学基础、深厚的人文与科学素养、创新思维、较强的交流能力和宽广的国际视野，能进入国内外一流大学和科研院所深造，或在物理学和光电子学领域从事教学与科学研究、新技术开发与应用，具备国际竞争力的复合型高端人才。

## 二、基本规格要求

应用物理专业学生要求掌握以下四项核心能力；

1. 扎实的物理基础、较强的物理及相关领域从事前沿科学研究的能力；
2. 扎实的光电子理论和技术基础、较强的光电子材料与器件设计能力；
3. 扎实的数学基础、较强的计算机技术应用能力；
4. 健康全面的人文素养、较强的交流与合作能力。

## 三、培养特色

1. 系统的物理学教学、创新训练，培养学生良好的科学素养与创新能力，为学生进入国际国内一流大学和科研机构深造奠定扎实的基础；
2. 系统的光电子科学与技术的课程教学、实验和实践教学，使学生毕业能很好地在经济社会发展最快最前沿的光电子行业学习深造、工作和研究；
3. 通过课程全英文教学、国际学术交流，使学生具有良好的国际视野和竞争力。

## 四、学制、毕业基本要求及学位授予

1. 本科基本学制 4 年，弹性学习年限 3—6 年，按照学分管理制度管理。
2. 应用物理专业学生毕业最低学分数为 165 学分，其中各类别课程及环节要求学分数如下表：

课程类别	通识必修	学门核心	学类核心	专业核心	专业选修	通识选修	集中实践	合计
学分数	27	25	30	18	24	8	33	165

3. 学生修满培养方案规定的必修课、选修课及有关环节，达到规定的最低毕业学分数，并修完规定必修但不记学分的所有课程和环节，德、智、体合格，即可毕业。满足学位授予相关文件要求的，授予理学学士学位。

## 五、课程设置及学分分布

### (一) 通识教育课程 [必修 27 + (6) 学分 + 选修 8 学分]

通识教育课程包括必修和选修两部分。通识选修课程按《湖南大学通识选修（文化素质教育）课程方案》实施，通识必修课程如下：

编码	课程名称	学分	备注
GE01101	毛泽东思想和中国特色社会主义理论体系概论	3+ (3)	
GE01039	思想道德修养与法律基础	1.5+ (1.5)	
GE01100	形势与政策	0.5+ (1.5)	
GE01102	中国近现代史纲要	2	
GE01103	马克思主义基本原理 (上)	2	
GE01104	马克思主义基本原理 (下)	2	
GE01012 (-15)	大学英语	8	
GE01088	计算机基本能力测试	0.5	
GE01095	计算机导论与程序设计	2.5	
GE01107 (-13)	心理素质与生涯发展	1	
GE01089 (-92)	体育	4	

**(二) 学门核心 (25 学分)**

编码	课程名称	学分	备注 (开课院系)
GE03025 (26)	高等数学 A	10	第 1、第 2 学期 (数学院)
GE03003	线性代数 A	3	第 2 学期 (数学院)
GE03004	概率论与数理统计 A	3	第 3 学期 (数学院)
GE03041	普通物理学 (1)	3	第 2 学期 (物电院)
GE03042	普通物理学 (2)	4	第 3 学期 (物电院)
GE03007 (08)	普通物理实验 A	2	第 2、3 学期 (物电院)

**(三) 学类核心 (30 学分)**

编码	课程名称	学分	备注
PH04001	电科与物理专业导论课	1	第 1 学期
PH04002	数学物理方法	3	第 3 学期
EI04029	电路	3	第 3 学期
EI04007	电路实验	1	第 3 学期
PH04003	模拟电子技术	3	第 4 学期
PH04004	数字电子技术	3	第 4 学期
PH04005	电子技术实验	2	第 4 学期
PH04006	电动力学	3	第 4 学期
PH04009	量子力学	3	第 4 学期
PH05009	分析力学	3	第 5 学期
PH04007	热力学与统计物理 (双语)	3	第 5 学期
PH04008	近代物理实验	2	第 5 学期

**(四) 专业核心 (18 学分)**

编码	课程名称	学分	备注
PH05018	光学原理	3	第 5 学期
PH05019	激光原理与应用 (全英文)	3	第 5 学期
PH05025	固体物理 A	3	第 5 学期
PH05020	光电子学基础	3	第 6 学期
PH05021	物理学与光电子学前沿讲座	1	第 6 学期
PH05022	专业综合实验	2	第 6、7 学期
PH05023	半导体物理	3	第 7 学期

**(五) 专业选修 (24 学分)**

编码	课程名称	学分	备注
PH06021	电子结构	2	第 6 学期
PH06022	计算物理	2	第 6 学期
PH06023	经典物理专题	2	第 6 学期
PH06024	量子力学专题	2	第 6 学期
PH06025	介观物理	2	第 6 学期
PH06011	非线性光学	2	第 6 学期
PH06026	微纳结构物理	2	第 6 学期
PH06020	自旋电子学导论	2	第 7 学期
PH06027	量子信息	2	第 7 学期
PH06028	纳米光子学	2	第 7 学期
PH06029	固体光谱学	2	第 7 学期
PH06030	光通讯原理	2	第 6 学期
PH06031	光电图像处理	2	第 6 学期
PH06032	波导光学	2	第 6 学期
PH06033	核能技术	2	第 6 学期
PH06034	锂电技术	2	第 6 学期
PH06035	光电显示原理与技术	2	第 7 学期
PH06036	光伏技术与应用	2	第 7 学期
PH06037	信息光学	2	第 7 学期
PH06038	光电子材料及其应用	2	第 7 学期
PH06013	光电探测技术	2	第 7 学期
PH06004	半导体器件与工艺 (全英文)	2	第 7 学期

注：1) 选修课，其中跨专业选修不超过 50%，建议选修一门管理类课程。

2) 学生参加学科竞赛、科研项目或发表论文，经学院学术委员会审定，可以替代专业选修学分，但最多不超过 4 学分。

**(六) 集中实践 (27 学分, 不包括通识教育课程中实践环节的 6 学分)**

编码	课程名称	学分	备注
GE09030	中文写作实训	1	短 1 (校定课程)
GE09017	金工实习 B	1	短 1 (校定课程)
GE09001	程序设计训练	2	短 1 (校定课程)
GE09020	电工电子实习	4	短 2 (校定课程)
EI10022	认识实习	1	第 6 学期 (系定课程)
EI10010	生产实习	2	短 3 (系定课程)
EI10014	毕业实习	2	短 3 (系定课程)
PH10011 (12)	专业综合课程设计	2	第 6、7 学期 (系定课程)
EI10051	毕业论文	12	第 8 学期 (导师课程)

## 六、课程责任教师一览表

序号	姓名	职称	学历学位	专业特长	课程 (专业核心、专业选修、通识选修)
1	陈克求	教授	博士	凝聚态理论、纳米电子学	量子力学、物理学与光电子学前沿讲座、量子力学专题
2	王玲玲	教授	博士	光电子学、光电材料物理与器件设计	光电子学基础、电科与物理专业导论课
3	刘全慧	教授	博士	理论物理	热力学与统计物理、量子信息
4	余亚斌	教授	博士	凝聚态理论	普通物理学(2)、介观物理
5	邓辉球	教授	博士	计算物理	电动力学、光电图像处理、核能技术
6	黄桂芳	教授	博士	光电材料物理	普通物理学(1)、光电显示原理与技术
7	潘安练	教授	博士	纳米光子学	纳米光子学
8	谢中	教授	博士	光电器件原理与设计	近代物理实验、光电探测技术
9	唐黎明	副教授	博士	半导体物理	普通物理学(2)、电子结构
10	黄维清	副教授	博士	光电子输运理论与计算	应用物理专业综合课程设计、光通讯原理
11	姚凌江	副教授	博士	半导体物理	半导体物理、近代物理实验、半导体器件与工艺
12	贺鹏斌	副教授	博士	凝聚态理论	普通物理学(1)、自旋电子学导论
13	张清林	副教授	博士	凝聚态物理	电路、光伏技术与应用
14	万强	副教授	博士	纳米光子学	微纳结构物理
15	庄秀娟	副教授	博士	纳米光子学	激光原理与技术、固体光谱学
16	马建民	副教授	博士	纳米光子学	锂电技术
17	李小凡	助理教授	博士	基础光学、计算物理	近代物理实验、专业综合实验、光电子材料及其应用
18	刘天贵	助理教授	博士	理论物理	数学物理方法、理论力学
19	周洪	助理教授	博士	凝聚态物理	模拟电子技术、近代物理实验
20	余继锋	助理教授	博士	凝聚态物理	固体物理、计算物理

## 七、专业责任教授

序号	姓名	职称	学历学位	专业特长	承担授课课程
1	陈克求	教授	博士	凝聚态理论、纳米电子学	量子力学、物理学与光电子学前沿讲座、量子力学专题

# Applied Physics

## I . Training Target

Through the systematic training of physics thinking, research methods, and the optoelectronic science and technology, students would have solid and broad foundation of physics and optoelectronics, deep humanistic and scientific literacy, innovative thinking, strong communication ability and world-wide view, and internationally competitive high-level comprehensive abilities, to enter the first-class universities and research institutes at home and abroad for further study, or to teach and research, develop and apply new technology in physics and optoelectronics.

## II . Basic Specification Requirements

Students majoring in Applied Physics are required to master the following four core competencies;

1. Solid foundation in Physics, relatively strong forefront scientific research ability in Physics and related fields;
2. Solid foundation in optoelectronic theory and technology, relatively strong design ability in optoelectronic material and device;
3. Solid foundation in mathematics, relatively strong ability in the application of computer technology;
4. Healthy and comprehensive humanistic literacy, relatively strong communication and cooperation ability.

## III . Training Features

1. Physics teaching and innovative training cultivate the students' good scientific literacy and innovative ability, laying a solid foundation for them to further study in first-class universities and research institutes at home and abroad;

2. The systematic course teaching, experiment and practice teaching of optoelectronic science and technology upgrade students to better positions for further study, work and research in the fast growing optoelectronic fields;

3. The international academic exchange projects and the academic courses teaching in English help students develop high-level international view and competitiveness.

## IV . Program Length, Basic Requirements for Graduation and Degree Granting

1. Basic length of 4 years and flexible length of 3—6 years, in accordance with the credit management system.

2. The lowest graduation requirement is 165 credits for applied physics students, including various types of courses and credits listed in the following table:

Course Category	General Required	Subject of Core	Study of Core	Professional Core	Professional Elective	General Elective	Centralized Practice	Total
Credits	27	25	30	18	24	8	33	165

3. Students who have completed the training program, i. e. the compulsory and elective courses; reached the minimum graduation credits required standards; finished all required but not credited courses; qualified in moral, intellectual and physical; are allowed to graduate. Also, if satisfying the requirements of the relevant documents for the degree-granting, they are granted the bachelor degree of science.

## V. Courses and Credits Distribution

1. General Education Courses [required 27 + (6) + elective 8 credits]

The general education courses consist of required courses and elective courses. General education electives are designed according to the *Curriculum Design of General Education Electives of Hunan University*. Required general education courses are illustrated in the following table.

Code	Course Title	Credit(s)	Remarks
GE01101	Introduction to Maoism and Theoretical System of Socialism with Chinese Characteristics	3+ (3)	
GE01039	Moral Cultivation and Law Basics	1.5+ (1.5)	
GE01100	Current Situation and Policies	0.5+ (1.5)	
GE01102	Outline of Modern Chinese History	2	
GE01103	Fundamentals of Marxism I	2	
GE01104	Fundamentals of Marxism II	2	
GE01012(-15)	College English	8	
GE01088	Computer Proficiency Test	0.5	
GE01095	Introduction to Computer Science and Programming	2.5	
GE01107(-13)	Psychological Health & Career Planning	1	
GE01089(-92)	Physical Education	4	

2. Subject of Core (25 credits)

Code	Course Title	Credit(s)	Remarks
GE03025(26)	Advanced Math A	10	1st and 2nd semester (College of Mathematics and Econometrics)
GE03003	Linear Algebra A	3	2nd semester (College of Mathematics and Econometrics)
GE03004	Theory of Probability and Mathematical Statistic A	3	3rd semester (College of Mathematics and Econometrics)
GE03041	General Physics I	3	2nd semester (College of Physics and Electronics)
GE03042	General Physics II	4	3rd semester (College of Physics and Electronics)
GE03007(08)	General Physics Experiment A	2	2nd and 3rd semester (College of Physics and Electronics)

### 3. Study of Core (30 credits)

Code	Course Title	Credit(s)	Remarks
PH04001	Electronic Science and Physics Specialty Introduction	1	1st semester
PH04002	Methods of Mathematical Physics	3	3rd semester
EI04029	Circuit	3	3rd semester
EI04007	Circuit Experiment	1	3rd semester
PH04003	Analog Electronic Technology	3	4th semester
PH04004	Digital Electronic Technology	3	4th semester
PH04005	Electronic Experiment	2	4th semester
PH04006	Electrodynamics	3	4th semester
PH04009	Quantum Mechanics	3	4th semester
PH05009	Analytical Mechanics	3	5th semester
PH04007	Thermodynamics and Statistical Physics (English and Chinese)	3	5th semester
PH04008	Modern Physics Experiment	2	5th semester

### 4. Professional Core (18 credits)

Code	Course Title	Credit(s)	Remarks
PH05018	Principles of Optics	3	5th semester
PH05019	Principle and Application of Laser (in English)	3	5th semester
PH05025	Solid State Physics A	3	5th semester
PH05020	Optoelectronics Foundation	3	6th semester
PH05021	Physics and Optoelectronics Cutting Edge Lectures	1	6th semester
PH05022	Specialty Comprehensive Experiment	2	6,7th semester
PH05023	Semiconductor Physics	3	7th semester

## 5. Professional Electives (24 credits) + General Education Electives (8 credits)

Code	Course Title	Credit(s)	Remarks
PH06021	Electronic Structure	2	6th semester
PH06022	Computational Physics	2	6th semester
PH06023	Classical Physics Topics	2	6th semester
PH06024	Quantum Mechanics Topics	2	6th semester
PH06025	Mesosopic Physics	2	6th semester
PH06011	Nonlinear Optics	2	6th semester
PH06026	Micro-nano Structures Physics	2	6th semester
PH06020	Introduction to Spintronics	2	7th semester
PH06027	Quantum Information	2	7th semester
PH06028	Nanophotonics	2	7th semester
PH06029	Solid Spectroscopy	2	7th semester
PH06030	Optical Communication Principle	2	6th semester
PH06031	Optical Image Processing	2	6th semester
PH06032	Waveguide Optics	2	6th semester
PH06033	Nuclear Energy Technology	2	6th semester
PH06034	Li-ion Battery Technology	2	6th semester
PH06035	Principle and Technology of Photoelec- tronic Display	2	7th semester
PH06036	Photovoltaic Technology and Applica- tion	2	7th semester
PH06037	Information Optics	2	7th semester
PH06038	Optoelectronic Materials and Applica- tions	2	7th semester
PH06013	Photoelectric Detection Technology	2	7th semester
PH06004	Semiconductor Devices and Technology (in English)	2	7th semester

Note:1)To highly recommend students selecting one management course for the optional courses,which no more than 50% for the cross-functionally requirements.

2)Audited and approved by School Academic Assessment Committee,the students' participate in the discipline competition,sci-entific research projects or published papers can be deemed as the optional course credits,which no more than 4.

## 6. Centralized Practice (27 credits, not including general education curriculum Practical Training 6 credits)

Code	Course Title	Credit(s)	Remarks
GE09030	Chinese Writing and Training	1	Short1 (Univ. set course)
GE09017	Metalworking Practice B	1	Short1(Univ. set course)
GE09001	Programming Training	2	Short1 (Univ. set course)
GE09020	Electrical and Electronic Practice	4	Short2(Univ. set course)
EI10022	Cognition Practice	1	6th semester (Department set course)
EI10010	Production Practice	2	Short3(Department set course)
EI10014	Graduation Practice	2	Short3(Department set course)
PH10011(12)	Specialty Course Design	2	6、7th semester (Department set course)
EI10051	Graduation Thesis	12	8th semester (Instructor Courses)



## VI. Course Instructor List

No.	Name	Professional Title	Education Degree	Specialty	Courses
1	Chen Keqiu	Professor	Ph. D	Condensed Matter Theory, Nanoelectronics	Quantum Mechanics, Physics and Optoelectronics Cutting Edge Lectures, Special Topics in Quantum Mechanics
2	Wang Lingling	Professor	Ph. D	Optoelectronics, Optoelectronic Material Physics and Device Design	Optoelectronic Foundation, Electronic Science and Physics Specialty Introduction
3	Liu Quanhui	Professor	Ph. D	Theoretic Physics	Thermodynamics and Statistical Physics, Quantum Information
4	Yu Yabin	Professor	Ph. D	Condensed Matter Theory	General Physics II, Mesoscopic physics
5	Deng Huiqiu	Professor	Ph. D	Computational Physics	Electrodynamics, Optoelectronic Image Processing, Nuclear Energy Technology
6	Huang Guifang	Professor	Ph. D	Optoelectronic Material Physics	General Physics I, Optoelectronic Display Principle and Technology
7	Pan Anlian	Professor	Ph. D	Nanophotonics	Nanophotonics
8	Xie Zhong	Professor	Ph. D	Optoelectronic Device and Principle Design	Modern Physics Experiment, Optoelectronic Detection Technology
9	Tang Liming	Associate Professor	Ph. D	Semiconductor Physics	General Physics II, Electronic Structure
10	Huang Weiqing	Associate Professor	Ph. D	Optoelectronic Transfer Theory and Computation	Comprehensive Course Design for Applied Physics Specialty, Optical Communication Principle
11	Yao Lingjiang	Associate Professor	Ph. D	Semiconductor Physics	Semiconductor Physics, Modern Physics Experiment, Semiconductor Device and Technology
12	He Pengbin	Associate Professor	Ph. D	Condensed Matter Theory	General Physics I, Spintronics Introduction
13	Zhang Qinglin	Associate Professor	Ph. D	Condensed Matter Physics	Electronic Circuit, Photovoltaic Technology and Application
14	Wang Qiang	Associate Professor	Ph. D	Nanophotonics	Micro-nano Structure Physics
15	Zhuang Xiujian	Associate Professor	Ph. D	Nanophotonics	Laser Principle and Technology, Solid Spectroscopy
16	Ma Jianmin	Associate Professor	Ph. D	Nanophotonics	Li-ion Battery Technology
17	Li Xiaofan	Assistant Professor	Ph. D	Optics, Computational Physics	Modern Physics Experiment, Comprehensive Experiment for Applied Physics Specialty, Optoelectronic Material and Application
18	Liu Tianguai	Assistant Professor	Ph. D	Theoretic Physics	Methods of Mathematical Physics, Theoretical Mechanics
19	Zhou Hong	Assistant Professor	Ph. D	Condensed Matter Physics	Analog Electronic Technology, Modern Physics Experiment
20	Yu Jifeng	Assistant Professor	Ph. D	Condensed Matter Physics	Solid State Physics, Computational Physics

## VII. Specialty Responsibility Professor

No.	Name	Professional Title	Education Degree	Specialty	Courses
1	Chen Keqiu	Professor	Ph. D	Condensed Matter Theory, Nanoelectronics	Quantum Mechanics, Physics and Optoelectronics Cutting Edge Lectures, Special Topics in Quantum Mechanics

(翻译人:姚凌江、余继锋)