宁波东方理工大学

2026 级数理基础科学本科专业培养方案

Curriculum for the Program of Fundamental Mathematics and Physics（2026）
Eastern Institute of Technology, Ningbo

一、专业介绍 Introduction to the Program

数理基础科学专业致力于培养兼具深厚数学与物理基础、跨学科研究能力及国际竞争力的复合型拔尖创新人才。毕业生将在人工智能、大数据、量子计算、航空航天、核物理、半导体等国家战略科技领域发挥关键作用，同时满足信息技术、生物技术、新材料技术等高新技术产业的迫切需求。本专业汇聚了 20 余位来自全球知名院所的顶尖人才，包括多位世界知名的国家特聘专家。这些拥有丰富教学经验和专业知识的专家学者，站在当代数学与物理研究的前沿，共同致力于推动数学和物理领域的知识创新和一流人才的培养，并着重于解决现实应用中的重大数学和物理问题，服务于国家和地方经济的战略需求。目前数学方向的研究主要涵盖以下三大领域：计算与应用数学、统计学与数据科学和基础数学。物理方向的研究主要涵盖以下领域：量子物理、光学、凝聚态物理和能源物理。

The Program of Fundamental Mathematics and Physics is dedicated to cultivating exceptional talents with a solid foundation in both disciplines, advanced interdisciplinary research skills, and the vision to excel on a global stage. Our graduates are equipped to drive innovation in strategically vital fields, including artificial intelligence, big data, quantum computing, aerospace, nuclear physics, and semiconductors. At the same time, they are positioned to contribute to the growing needs of cutting-edge industries, including information technology, biotechnology, and advanced materials. The Program has assembled over 20 leading scholars from globally renowned institutions, including an exclusive group of nationally appointed world class experts. These experts, who are advancing the frontiers of contemporary mathematics and physics research, are working collaboratively to drive knowledge innovation, cultivate top-tier talent, and address critical real-world mathematical and physical challenges, aligning with the strategic needs of national and regional economic development. Current mathematics research centers on three key areas: computational and applied mathematics, statistics and data science, and fundamental mathematics. In physics, the program pursues cutting-edge research work in quantum physics, optics, condensed matter physics, and energy physics.

二、培养目标 Program Objective

本专业面向国家实现高水平科技自立自强的战略需求，培养德智体美劳全面发展、具备家国情怀、扎实数理基础、国际视野与创新能力，能够在数理科学及相关交叉领域开展研究与创新实践的拔尖创新人才。毕业后 5 年左右，毕业生预期能够达到以下培养目标：

This program is designed to meet the nation’s strategic needs for achieving high-level scientific and technological self-reliance and self-strengthening. It aims to

cultivate top-tier innovative talents who are well-rounded in moral, intellectual, physical, aesthetic, and labor education; possess a strong sense of social responsibility and commitment to the nation; demonstrate a solid foundation in mathematics and physics, a global perspective, and strong innovative capabilities; and are able to engage in research and innovative practice in mathematical and physical sciences as well as related interdisciplinary fields. Approximately five years after graduation, graduates are expected to achieve the following objectives:

1.能够在数学、物理及相关交叉领域继续深造，或在科研院所、高新技术企业及相关行业从事研究、开发与技术创新工作；

Graduates have successfully established themselves in advanced academic degrees in mathematics, physics, or interdisciplinary sciences, or are actively driving research, technical development, and cross-disciplinary innovation within research institutes, high-technology enterprises, and quantitative industries.

2.能够综合运用数学、物理及计算科学知识分析和解决复杂科学问题，具备跨学科协同创新能力；

Graduates actively apply their ability to integrate mathematical theories, physical principles, and computational methodologies to investigate and solve complex scientific problems, while leading or executing collaborative research across diverse, multidisciplinary teams.

3.具有良好的科学素养、职业道德以及团队协作解决复杂问题的能力；

Graduates demonstrate strong scientific literacy, professional ethics, and the ability to work collaboratively in teams to address and solve complex scientific and technological problems.

4.具有良好的国际交流能力，能够适应科技发展与社会需求；

Graduates consistently demonstrate strong cross-cultural and international communication skills within their professional and academic networks.

5.具有终身学习意识与持续发展能力，能够跟踪国际学术前沿并不断提升专业水平。

Graduates actively utilize their lifelong learning capacity to adapt dynamically to rapid technological advancements and evolving societal needs.

三、培养要求 Graduate Outcomes

1.素养要求：自觉践行社会主义核心价值观，具有良好的职业道德、社会责任感和可持续发展理念；适应科学技术进步和社会经济发展需求；具有良好的人文素养，了解国情与国际形势、具有家国情怀。该毕业要求主要支撑总体培养目标与培养目标（2）（3）（4）（5）。

Ethical Competencies: Demonstrate proactive adherence to socialist core values, uphold professional ethics, social responsibility, and sustainable development principles. Adapt to advancements in science, technology, and socio-economic demands. Possess a well-rounded humanistic literacy, understand national conditions and global trends, and exhibit a deep sense of patriotism. This graduate outcome

primarily supports the overall program objectives as well as Program Educational Objectives (2), (3), (4) and (5).

2.知识要求：掌握数学、物理学和科学计算的基础知识，具备解决实际科学问题的理论基础；掌握信息科学、人工智能等前沿交叉学科的相关知识。该毕业要求主要支撑总体培养目标与培养目标（1）（2）（3）（5）。

Knowledge Requirements: Master foundational knowledge in mathematics, physics, and scientific computing, with a theoretical basis for addressing practical scientific challenges. Acquire expertise in cutting-edge interdisciplinary fields such as information science and artificial intelligence. This graduate outcome primarily supports the overall program objectives as well as Program Educational Objectives (1), (2), (3) and (5).

3.能力要求：具备终身学习能力、思辨能力和创造性思维、使用数理科学原理进行创新和实践的能力；具有良好的沟通能力、团队协作能力、领导能力等基本素质；具备创新精神、国际化视野和跟踪国际前沿领域发展的洞察力；通过数学和物理学科交叉，掌握运用不同学科知识解决复杂问题的综合能力。该毕业要求支撑所有培养目标。

Skill Requirements: Develop lifelong learning capabilities, critical and creative thinking, and the ability to innovate and apply principles of mathematical and physical sciences. Demonstrate strong communication, teamwork, and leadership skills. Foster an innovative spirit, global vision, and insight to track international advancements in cutting-edge fields. Cultivate comprehensive problem-solving skills by integrating multidisciplinary knowledge through mathematics-physics cross-disciplinary approaches. This graduate outcome supports all Program Educational Objectives.

四、培养特色 Program Highlights

人工智能（AI）时代背景下，本专业结合实践教学与 AI 辅助教学，培养学生的自主学习、知识融通与实践创新能力；顺应数理科学的发展趋势，突出数学与物理基础的交叉特色，致力于培养具有批判性思维、国际化视野和创新精神的拔尖人才。具体培养特色包括：

In the era of artificial intelligence (AI), this program integrates hands-on practice with AI-assisted teaching to foster students' abilities in self-directed learning, knowledge integration, and innovative problem-solving. In alignment with the evolving trends of mathematical and physical sciences, the program emphasizes the interdisciplinary foundations of mathematics and physics, aiming to nurture top-tier talents with critical thinking skills, global perspectives, and innovative spirit. Key features of the program include:

1.强化通识教育：全校课程设置采用"1+3"模式，第一学年不分专业，在强化数理化基础和计算能力的同时，强化科技教育与人文教育协同，提高学生创新意识，提升写作与沟通能力；学生在第二学期末开始选择专业，之后进入为期两年的专业培养；第四学年在专业选修课的同时，进行创新实践与毕业设计。

Emphasis on General Education: The university adopts a '1+3' curriculum structure: during the first academic year, students are not assigned to a specific major, enabling them to build a strong foundation in mathematics, physics, chemistry, and computational thinking ability. The program emphasizes a coordinated development of

science, technology, and humanities to enhance creativity, writing, and communication skills. Students will select their majors at the end of the second term and, thereafter, enter two years of specialized study. In the fourth year, students will work on their graduation project while taking major electives.

2.书院制培养：实行书院制和生活导师制，开展全员、全过程、全方位育人，致力于培养学生的表达与沟通能力、团队协作能力、领导力等综合素质。

Residential College Model: A residential college and mentorship system is in place to support holistic education through all stages of student development. This model aims to cultivate students' communication, teamwork, and leadership abilities, as well as their overall personal growth.

3.本研贯通：实行学术导师制，强化科研与创新能力培养；鼓励学生及早参与科研创新活动，融合为期一年的本科"创新实践与毕业设计"与科研课题，为学生进入国内外大学攻读硕、博研究生学位做好准备，加速急需拔尖人才培养。

Integrated Undergraduate–Graduate Pathways: An academic advisory system is implemented to strengthen research and innovation training. Students are encouraged to participate in research projects early on, with the year-long "Innovation Practice and Graduation Project" closely integrated with faculty-led research. This approach prepares students for advanced study at top universities in China and abroad, and accelerates the development of top-tier innovative professionals in high demand.

4.加强科教实践：促进产教融合，设置夏季学期实践必修课程，鼓励参与夏季学期科研，系统化支持学生进入科研机构、企事业单位等，参与以实践项目为驱动的全过程人才培养。

Enhanced Scientific and Industrial Practice: To promote university-industry collaboration, a compulsory summer practice module is offered. Students are encouraged to participate in research activities during the summer term and are systematically supported in engaging with research institutes, enterprises, and organizations through project-based learning experiences.

5.国际化培养：发挥国际化师资优势，专业课实行双语教学，支持学生赴世界一流大学与机构参与国际交流、项目合作，拓宽视野，提升国际竞争力。

Global Competence Development: Leveraging a globally oriented faculty team, the program incorporates bilingual instruction in core courses and supports student participation in international exchanges and collaborative projects at top world institutions, broadening their horizons and enhancing global competitiveness.

6.智能化教育：探索 AI 时代的教学变革，利用智能工具提高知识传授与学习效率；开设人工智能通识课，培养学生利用数字资源和智能工具的自主学习能力。

AI for Education: Explore teaching transformation in the AI era, and enhance teaching and learning efficiency by making use of AI tools; Offer Introduction to AI course, enabling students to develop self-education abilities with digital resources and AI tools.

五、学制和授予学位 Program Duration and Degree Awarded

专业学制：基本学制4年，采用学分制管理，实行弹性学习年限，最多不超过6年。

授予学位：对完成并符合培养方案学位要求的学生，授予理学学士学位。

Program Duration: The standard duration of the program is four years. A credit-based management system is adopted, with maximum 6 years of study.

Degree Awarded: Students who have completed the program and met the degree requirements stipulated in this Program Curriculum will be awarded the Bachelor of Science degree.

六、毕业学分要求 Credit Requirements for Graduation

毕业最低学分要求为 153 学分。课程结构要求如下：

A minimum of 153 credits is required for graduation. The curriculum structure is as follows:

课程模块 Module	课程要求 Requirement	课程类别 Category	学分 Credits
通识与基础课程 General Education and Foundational Module （81学分/Credits）	必修 Required	公共通识必修课 General Education Required Courses	41
		理工基础课 Fundamental Science and Engineering Courses	32
	选修 Elective	通识选修课 General Education Elective Courses	8
专业课程 Major-specific Module （52学分/Credits）	必修/限选 Required/Restricted Elective	学科基础课程 Discipline-specific Foundational Module	31
	限选 Restricted Elective	专业核心课 Major Core Courses	8
	选修 Elective	专业选修课 Major Elective Courses	13
集中实践环节 Intensive Practical Training Module （20学分/Credits）	必修 Required	夏季学期实践 Internship	12（24周/Weeks）
		毕业论文 Dissertation	8（32周/Weeks）
毕业学分要求 Graduation Credits Requirement			153

基于国标要求的各指标如下：Credit Distribution Against National Standard Requirements

课程类别 Category	学分 Credit	所占比例 Percentage (%)	国标要求 National Standard (%)
数理通识课程 Mathematical and Scientific General Education Courses	32	68.0%	60%
专业必修课程和实践环节 Specialized Compulsory Courses	59		

专业选修课 Specialized Elective Courses	13		
实践课程和实践学分 Applied Practice Courses	41.5	27.1%	20%

七、主要课程设置 Core Courses

高等数学分析、常微分方程、数学物理方法、近代物理、经典力学、复变函数、代数学导论、电动力学、实变函数、数理统计、统计力学、几何学导论、泛函分析、偏微分方程、量子力学。

Advanced Mathematical Analysis, Ordinary Differential Equations, Mathematical Physics, Modern Physics, Classical Mechanics, Complex Analysis, Introduction to Algebra, Electrodynamics, Real Analysis, Mathematical Statistics, Statistical Mechanics, Introduction to Geometry, Functional Analysis, Partial Differential Equations, Quantum Mechanics.

八、主要实践性教学环节和主要专业实验

Practical Training Activities and Major Experiments

主要实践性教学环节包括：夏季学期认知实践、专业实践和创新实践，第四学年全年毕业设计，以及各类国内外本科生学术竞赛、创新大赛等。另外，本科生入学即选择学术导师团队，及早参与科研，期间可以选择与夏季学期实践、第四学年毕业设计相融合。

Practical Training Activities: Summer Internship I, Summer Internship II, Summer Internship III, Capstone Project, and Undergraduate Academic Competitions. Undergraduates join faculty mentors upon enrollment for early research exposure, which can be integrated with summer Internship and Capstone Project.

主要专业实验包括：近代物理实验I-II。

Experiments: Modern Physics Laboratory I-II。

详细内容请参见附表一。

For details, please refer to Appendix Table 1.

九、课程设置与要求 Course Structure and Requirements

本培养方案的课程设置包括三个模块：通识与基础课程模块、专业课程模块以及集中实践环节模块。通识与基础课程模块和集中实践环节模块强支撑三个培养要求，专业课程模块主要支撑培养要求中的知识和能力要求，一定程度上支撑素养要求。

There are three modules in the course structure: General Education and Foundation Module (GEFM), Major-specific Module (MSM), and Intensive Practical Training Module (IPTM). GEFM and IPTM strongly support all requirements outlined in the program's educational objectives. MSM primarily supports the knowledge and skill requirements, while also contributing to the ethical competencies to a certain extent.

（一）通识与基础课程 General Education and Foundational Module

1.公共通识必修课程 General Education Required Courses

（1）思想政治理论课 Ideological and Political Theory Courses

课程代码 Course Code	课程名称 Course Name	必修选修 Required/ Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
GENE1101	思想道德与法治 Ethics and Rule of Law	必 Required	3	1	3	无 None	1/秋 Y1/Fall
GENE1102	马克思主义基本原理 Basic Principles of Marxism	必 Required	3	1	3	无 None	1/春 Y1/Spring
GENE2101	中国近现代史纲要 Modern Chinese History: A Survey	必 Required	3	1	3	无 None	2/秋 Y2/Fall
GENE2102	毛泽东思想和中国特色社会主义理论体系概论 Introduction to Maoism and Chinese Socialism	必 Required	2		2	无 None	2/春 Y2/Spring
GENE3101	习近平新时代中国特色社会主义思想概论 Introduction to Xi Thought on Chinese Socialism	必 Required	3	1	3	无 None	3/秋 Y3/Fall
GENE1103	形势与政策I Society and Public Policy in Contemporary China I	必 Required	0.5		0.5	无 None	1/秋 Y1/Fall
GENE1104	形势与政策II Society and Public Policy in Contemporary China II	必 Required	0.5		0.5	无 None	1/春 Y1/Spring
GENE2103	形势与政策III Society and Public Policy in Contemporary China III	必 Required	0.5		0.5	无 None	2/秋 Y2/Fall
GENE2104	形势与政策IV Society and Public Policy in Contemporary China IV	必 Required	0.5		0.5	无 None	2/春 Y2/Spring
GENE3301	思想政治理论课实践 Political Theory and Ideology: Experiential Learning	必 Required	2	2	2	无 None	3/秋 Y3/Fall
GENE3302	劳动教育实践 Practical Labor Education	必 Required	1	1	2	无 None	*
小计/Subtotal			19	7	20		
*具体见通识培养方案 For details, please refer to the Curriculum for General Education.							

（2）军事体育健康课 Military, Physical Education and Health Courses

课程代码 Course Code	课程名称 Course Name	必修选修 Required/ Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
GENE1001	军事技能训练 Military Skills Training	必 Required	2	2		无 None	夏 Summer
GENE1002	军事理论与国家安全教育 Military Theory	必 Required	3			无 None	夏 Summer
GENE1401	体育与健康I Physical Education I	必 Required	0.5	0.5	2	无 None	1/秋 Y1/Fall
GENE1402	体育与健康II Physical Education II	必 Required	0.5	0.5	2	无 None	1/春 Y1/Spring
GENE2401	体育与健康III Physical Education III	必 Required	0.5	0.5	2	无 None	2/秋 Y2/Fall
GENE2402	体育与健康IV Physical Education IV	必 Required	0.5	0.5	2	无 None	2/春 Y2/Spring
GENE3401	体育与健康V Physical Education V	必 Required	0.5	0.5	2	无 None	3/秋 Y3/Fall
GENE3402	体育与健康VI Physical Education VI	必 Required	0.5	0.5	2	无 None	3/春 Y3/Spring
小计/Subtotal			8	5	12		

（3）语言和沟通技能提升课 Language and Communication Skills Courses

英语实行 ABC 三级分级教学，根据不同等级要求，总计修满 12 学分。

The English curriculum follows a three-tier A, B, and C level system. Students are required to complete a total of 12 credits according to their assigned level.

课程代码 Course Code	课程名称 Course Name	必修选修 Required / Elective	要求 Requirements	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
LC1501	大学英语I-A General Academic English I-A	必 Required	A级修读 Required for Level A	3		4	无 None	1/秋 Y1/Fall
LC1502	大学英语II-A General Academic English II-A	必 Required		3		4	LC1501	1/春 Y1/Spring
LC2501	大学英语III-A General Academic English III-A	必 Required		3		4	LC1502	2/秋 Y2/Fall
LC1503	大学英语I-B General Academic English I-B	必 Required	B级修读 Required for Level B	3		4	无 None	1/秋 Y1/Fall
LC1504	大学英语II-B General Academic English II-B	必 Required		3		4	LC1503	1/春 Y1/Spring
LC2502	大学英语III-B General Academic English III-B	必 Required		3		4	LC1504	2/秋 Y2/Fall
LC1505	大学英语I-C General Academic English I-C	必 Required	C级修读 Required for Level C	3		4	无 None	1/秋 Y1/Fall
LC1506	大学英语II-C General Academic English II-C	必 Required		3		4	LC1505	1/春 Y1/Spring
LC2503	大学英语III-C General Academic English III-C	必 Required		3		4	LC1506	2/秋 Y2/Fall
LC2504	学术英语写作与交流 Academic Writing and Presentation	必 Required	所有学生修读 Required for All Levels (A, B, C)	3		4	LC2501/ LC2502/ LC2503	2/春 Y2/Spring
小计/Subtotal				30		40		

其他沟通技能提升课程要求如下：Other requirements:

课程代码 Course Code	课程名称 Course Name	必修选修 Required/ Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
GENE2301	沟通与协作 Communication and Collaboration	必 Required	2		2	无 None	2/秋 Y2/Fall
小计/Subtotal			2		2		

2.理工基础课 Fundamental Science and Engineering Courses

课程代码 Course Code	课程名称 Course Name	必修选修 Required/ Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
MATH1101	高等数学I Calculus I	必 Required	4		5	无 None	1/秋 Y1/Fall
MATH1102	高等数学II Calculus II	必 Required	4		5	MATH1101	1/春 Y1/Spring
MATH1103	线性代数 Linear Algebra	必 Required	3		4	无 None	1/秋 Y1/Fall
MATH2101	概率论与数理统计 Probability Theory and Mathematical Statistics	必 Required	3		3	MATH1102	2/秋 Y2/Fall
PHYS1101	大学物理I General Physics I	必 Required	4		4	无 None	1/秋 Y1/Fall
PHYS1102	大学物理II General Physics II	必 Required	4		4	PHYS1101	1/春 Y1/Spring
PHYS1301	大学物理实验I General Physics Experiments	必 Required	1	1	1	无 None	1/秋 Y1/Fall

PHYS1302	大学物理实验II General Physics Experiments	必 Required	1	1	1	PHYS1301	1/春 Y1/Spring
CHEM1101	大学化学 General Chemistry	必 Required	3	1	3	无 None	1/春 Y1/Spring
CS1001	人工智能通识 Introduction to AI	必 Required	2	1	2	无 None	1/秋 Y1/Fall
CS1101	Python程序设计基础 Fundamentals of Python Programming	必 Required	3	1	3	无 None	1/春 Y1/Spring
小计/Subtotal			32	5	35		

3.通识选修课程修读要求 Requirements for General Education Elective Courses

下列类型课程有最低学分修读要求

The following types of courses have a minimum credit requirement.

课程类型 Course Type	必修选修 Required/ Elective	最低学分要求 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	推荐修读学期 Rocommended Term
人文社科类通识课 Humanity and Social Science	选 Elective	2		2		2/秋 Y2/Fall
艺术类通识课 Arts	选 Elective	2		2		2/春 Y2/Spring
创新创业类通识课 Entrepreneurship	选 Elective	2	0.5	2		3/秋 Y3/Fall
其他通识课 Others	选 Elective	2		2		3/春 Y3/Spring
小计/Subtotal		8	0.5	8		

（二）专业课程 Major-specific Module

学生可以选择侧重数学方向或侧重物理方向修读。毕业时需满足所选方向全部课程及学分要求。Students may choose to follow either the Mathematics emphasis or the Physics emphasis. Graduation requires fulfillment of all course and credit requirements in the chosen emphasis.

1.学科基础课程 Discipline-specific Foundational Module

课程代码 Course Code	课程名称 Course Name	必修选修 Required / Elective	要求 Requirements	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
MATH2201	常微分方程 Ordinary Differential Equations	必 Required	所有学生修读 Required for All	3		3	MATH1102	2/秋 Y2/Fall
PHYS2101	数学物理方法 Mathematical Physics	必 Required		4		4	MATH1102 PHYS1102	2/春 Y2/Spring
MATH2202	高等数学分析 Mathematical Analysis	必 Required	侧重数学方向学生必修，侧重物理方向学生可作为专业选修 Required for students with a mathematics emphasis; may be taken as a Major Elective by students with a physics emphasis.	4		4	MATH1102	2/秋 Y2/Fall

PHYS2201	近代物理 Modern Physics	必 Required	侧重物理方向学生必修，侧重数学方向学生可作为专业选修 Required for students with a physics emphasis; may be taken as a Major Elective by students with a mathematics emphasis.	4		4	PHYS1102	2/秋 Y2/Fall
MATH2203*	复变函数* Complex Analysis	限选 Restricted elective	所有学生需从带*课程中至少修读20个学分，超出学分归入选修课学分 All students are required to complete at least 20 credits from the courses marked with an asterisk (*). Any surplus credits will count toward elective requirements.	3		3	MATH1102	2/春 Y2/Spring
MATH2204*	代数学导论* Abstract Algebra	限选 Restricted elective		3		3	MATH1103	2/春 Y2/Spring
MATH3201*	实变函数* Real Analysis	限选 Restricted elective		3		3	MATH2202	3/秋 Y3/Fall
MATH3202*	数理统计* Mathematical Statistics	限选 Restricted elective		3		3	MATH2202	3/秋 Y3/Fall
PHYS2202*	经典力学* Classical Mechanics	限选 Restricted elective		4		4	PHYS1101	2/秋 Y2/Fall
PHYS2203*	统计力学* Statistical Mechanics	限选 Restricted elective		4		4	PHYS1101	2/春 Y2/Spring
PHYS3201*	电动力学* Electrodynamics	限选 Restricted elective		4		4	PHYS1102	3/秋 Y3/Fall
PHYS3202*	量子力学* Quantum Mechanics	限选 Restricted elective		4		4	PHYS1102	3/春 Y3/Spring
小计/Subtotal				43		43		

【说明】经相关学院教学负责人事先书面认定，可允许以更高层次或相当层次的相近课程替代数理基础专业的学科基础课。[Note] Students may substitute a discipline-specific foundational course with a higher-level or equivalent-level related course, provided prior written approval is obtained from the academic coordinator of the relevant school.

2.专业核心课 Major Core Courses

所有学生需从本模块课程中至少修读 8 个学分，超出学分归入选修课学分。

All students are required to complete at least 8 credits from the following Major Core Courses. Any surplus credits will count toward Major Elective requirements.

课程代码 Course Code	课程名称 Course Name	必修选修 Required/ Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
MATH3203	几何学导论 Introduction to Geometry	限选 Restricted elective	3		3	MATH2201 MATH2202	3/秋 Y3/Fall
MATH3204	泛函分析 Functional Analysis	限选 Restricted elective	3		3	MATH1103 MATH3201*	3/春 Y3/Spring
MATH3205	偏微分方程 Partial Differential Equations	限选 Restricted elective	3		3	MATH1103 MATH2201 MATH2202	3/春 Y3/Spring

PHYS2301	近代物理实验I Modern Physics Experiment I	限选 Restricted elective	2	2	2	PHYS1302	2/秋 Y2/Fall
PHYS2302	近代物理实验II Modern Physics Experiment II	限选 Restricted elective	2	2	2	PHYS2301	2/春 Y2/Spring
PHYS3203	固体物理 Solid State Physics	限选 Restricted elective	4		4	PHYS2201 PHYS3201	3/秋 Y3/Fall
小计/Subtotal			17	4	17		

3.专业选修课(至少修读13学分,可自主修读,也可参考附表二的推荐修读"套餐",如学科基础课与核心课学分总和超过要求学分,选修课学分要求可按超出部分减免。)

Major Elective Courses (At least 13 credits must be completed for students. Students may choose courses independently or follow the recommended course packages listed in Appendix II. If the total number of credits from foundational and core courses exceeds the required credits, the elective credit requirement may be reduced by the excess amount.)

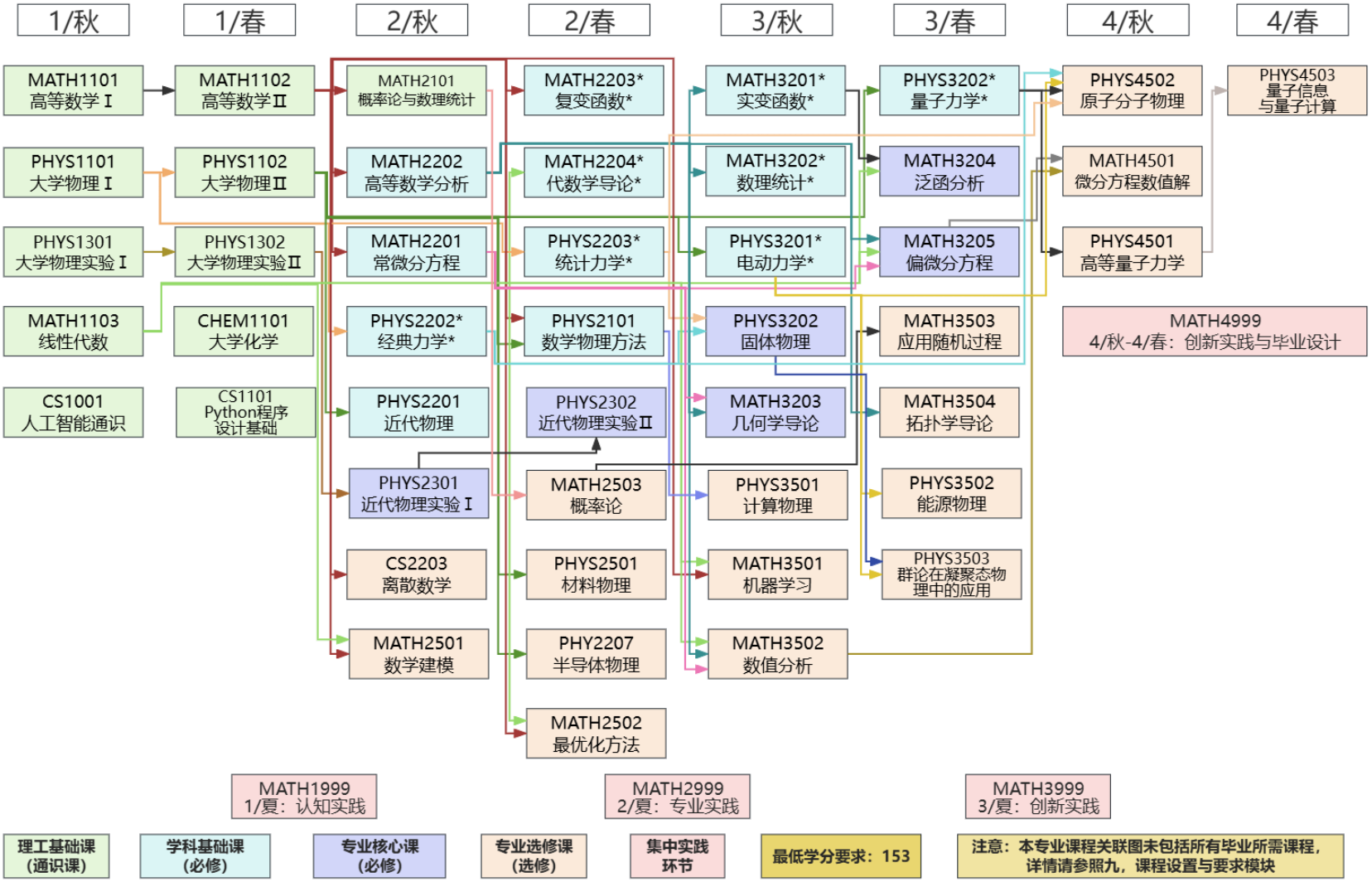
课程代码 Course Code	课程名称 Course Name	必修选修 Required / Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
CS2203	离散数学 Discrete Mathematics	选 Elective	2		2	MATH1102	2/秋 Y2/Fall
MATH2501	数学建模 Mathematical Modeling	选 Elective	2		2	MATH1102 MATH1103	2/秋 Y2/Fall
PHYS2001	物理前沿讲座I Seminar on Frontier Physics I	选 Elective	1		1	无 None	2/秋 Y2/Fall
PHYS2501	材料物理 Materials Physics	选 Elective	3		3	PHYS1102	2/春 Y2/Spring
PHYS2207	半导体物理 Semiconductor Physics	选 Elective	3		3	PHYS1102	2/春 Y2/Spring
MATH2502	最优化方法 Optimization	选 Elective	3		3	MATH1102 MATH1103	2/春 Y2/Spring
MATH2503	概率论 Probability Theory	选 Elective	3		3	MATH2101	2/春 Y2/Spring
PHYS2002	物理前沿讲座II Seminar on Frontier Physics II	选 Elective	1		1	无 None	2/春 Y2/Spring
MATH3501	机器学习 Machine Learning	选 Elective	3		3	MATH1102 MATH1103	3/秋 Y3/Fall
MATH3502	数值分析 Numerical Analysis	选 Elective	3		3	MATH1103 MATH2201 MATH2202	3/秋 Y3/Fall
PHYS3501	计算物理 Computational Physics	选 Elective	3		3	PHYS2101	3/秋 Y3/Fall
PHYS3001	物理前沿讲座III Seminar on Frontier Physics III	选 Elective	1		1	无 None	3/秋 Y3/Fall
MATH3503	应用随机过程 Applied Stochastic Processes	选 Elective	3		3	MATH2503	3/春 Y3/Spring
MATH3504	拓扑学导论 Introduction to Topology	选 Elective	3		3	MATH2201	3/春 Y3/Spring
PHYS3502	能源物理 Energy Physics	选 Elective	3		3	PHYS3201*	3/春 Y3/Spring
PHYS3503	群论在凝聚态物理中的应用 Applications of Group Theory in Condensed Matter Physic	选 Elective	3		3	PHYS3201* PHYS3501	3/春 Y3/Spring
PHYS3002	物理前沿讲座IV Seminar on Frontier Physics IV	选 Elective	1		1	无 None	3/春 Y3/Spring
MATH4501	微分方程数值解 Numerical Methods for Differential Equations	选 Elective	3		3	MATH3205 MATH3502	4/秋 Y4/Fall

MATH4001	数学前沿讲座 Frontiers in Mathematics	选 Elective	2		2	无 None	4/秋 Y4/Fall
PHYS4501	高等量子力学 Advanced Quantum Mechanics	选 Elective	3		3	PHYS3202*	4/秋 Y4/Spring
PHYS4502	原子分子物理 Atomic and Molecular Physics	选 Elective	4		4	PHYS2201 PHYS2202* PHYS3201* PHYS3202*	4/秋 Y4/Fall
PHYS4001	物理前沿讲座V Seminar on Frontier Physics V	选 Elective	1		1	无 None	4/秋 Y4/Fall
PHYS4503	量子信息与量子计算 Quantum Information and Quantum Computation	选 Elective	2		2	PHYS4501	4/春 Y4/Spring
PHYS4002	物理前沿讲座VI Seminar on Frontier Physics VI	选 Elective	1		1	无 None	4/春 Y4/Spring
小计/Subtotal			57		57		

（三）集中实践环节 Intensive Practical Training Module

课程代码 Course Code	课程名称 Course Name	必修选修 Required/ Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
MATH1999	认知实践 Summer Internship I	必 Required	4	4	8 周/ Weeks	无 None	1/夏 Y1/Summer
MATH2999	专业实践 Summer Internship II	必 Required	4	4	8 周/ Weeks	无 None	2/夏 Y2/Summer
MATH3999	创新实践 Summer Internship III	必 Required	4	4	8 周/ Weeks	无 None	3/夏 Y3/Summer
MATH4999	毕业论文 Dissertation	必 Required	8	8	32 周/ Weeks	无 None	4/秋-4/春 Y4/Fall-Y4/Spring
小计/Subtotal			20	20	56 周/ Weeks		

十、专业课程关联图 Roadmap for Major Courses



附表一：主要专业实验和集中实践性环节

Appendix Table 1: Major Experiments and Intensive Practical Training Activities

课程代码 Course Code	课程名称 Course Name	必修选修 Required/ Elective	总学分 Credits	实践学分 Practical Credits	周学时 Weekly Load	先修课程 Prerequisites	学期 Term
PHYS1301	大学物理实验I General Physics Experiments	必 Required	1	1	1	无 None	1/秋 Y1/Fall
PHYS1302	大学物理实验II General Physics Experiments	必 Required	1	1	1	PHYS1301	1/春 Y1/Spring
PHYS2301	近代物理实验I Modern Physics Experiment I	限选 Restricted elective	2	2	2	PHYS1302	2/秋 Y2/Fall
PHYS2302	近代物理实验II Modern Physics Experiment II	限选 Restricted elective	2	2	2	PHYS2301	2/春 Y2/Spring
MATH1999	认知实践 Summer Internship I	必 Required	4	4	8 周/ Weeks	无 None	1/夏 Y1/Summer
MATH2999	专业实践 Summer Internship II	必 Required	4	4	8 周/ Weeks	无 None	2/夏 Y2/Summer
MATH3999	创新实践 Summer Internship III	必 Required	4	4	8 周/ Weeks	无 None	3/夏 Y3/Summer
MATH4999	毕业论文 Dissertation	必 Required	8	8	32 周/ Weeks	无 None	4/秋-4/春 Y4/Fall-Y4/Spring
小计/Subtotal			26	26	6+56 周/ Weeks		

附表二：专业选修课修读方向推荐

可侧重修读下列 4 个方向之一的课程，为未来进入该领域的研究打下基础。

Appendix Table 2: Recommended Directions for Elective Courses in the Major. Students may choose to focus on one of the following 4 directions, laying a foundation for future research in the field.

方向一：基础科学方向 **Direction 1：Fundamental Sciences**		**方向二：计算科学方向** **Direction 2：Computational Science**	
课程代码 **Course Code**	**课程名称** **Course Name**	**课程代码** **Course Code**	**课程名称** **Course Name**
CS2203	离散数学 Discrete Mathematics	MATH2501	数学建模 Mathematical Modeling
MATH2503	概率论 Probability Theory	MATH2502	最优化方法 Optimization
MATH3501	机器学习 Machine Learning	MATH3501	机器学习 Machine Learning
MATH3503	应用随机过程 Applied Stochastic Processes	MATH3502	数值分析 Numerical Analysis
MATH3504	拓扑学导论 Introduction to Topology	MATH4001	数学前沿讲座 Frontiers in Mathematics
MATH4001	数学前沿讲座 Frontiers in Mathematics	MATH4501	微分方程数值解 Numerical Methods for Differential Equations
方向三：凝聚态物理方向 **Direction 3：Condensed Matter Physics**		**方向四：量子物理方向** **Direction 4：Quantum Physics**	
课程代码 **Course Code**	**课程名称** **Course Name**	**课程代码** **Course Code**	**课程名称** **Course Name**
MATH3501	机器学习 Machine Learning	MATH3502	数值分析 Numerical Analysis
MATH3502	数值分析 Numerical Analysis	MATH3504	拓扑学导论 Introduction to Topology
MATH3503	应用随机过程 Applied Stochastic Processes	PHYS2001/2 PHYS3001/2 PHYS4001/2	物理前沿讲座I-VI Frontiers in Physics I-VI
MATH4501	微分方程数值解 Numerical Methods for Differential Equations	PHYS4501	高等量子力学 Advanced Quantum Mechanics
PHYS3501	计算物理 Computational Physics	PHYS4503	量子信息与量子计算 Quantum Information and Quantum Computation
PHYS2001/2 PHYS3001/2 PHYS4001/2	物理前沿讲座I-VI Frontiers in Physics I-VI		