物理建模 A 教学大纲

Physical Modelling A Subject Syllabus

一、课程信息 Subject Information

课程编号: Subject ID	3070111011	开课学期: Semester	2
课程分类: Category	专业教育 PA	所属课群: Section	专业基础 MF
课程学分: Credit Points	4.5	总学时/周: Total Hours/Weeks	72
理论学时: LECT. Hours	72	实验学时: EXP. Hours	0
PBL 学时: PBL Hours	0	实践学时/周: PRAC. Hours/Weeks	0
开课学院: College	东北大学 悉尼智能科技学院	适用专业: Stream	CST/CE/AS
课程属性: Pattern	必修 Compulsory	课程模式: Mode	自建 NEU
中方课程协调人: NEU Coordinator	王晓强	成绩记载方式: Result Type	百分制 Marks
先修课程: Requisites	数学建模 1		
英文参考教材: EN Textbooks	Douglas C. Giancoli, 滕小瑛改编, Physics for Scientists and Engineers with Modern Physics, Third Edition, 高等教育出版社, 2005		
中文参考教材: CN Textbooks	王登龙等,《大学物理学（力学与电磁学）》（第 1 版），北京邮电大学出版社，2017		
教学资源: Resources	超星学习通		
课程负责人(撰写人): Subject Director	王晓强	提交日期: Submitted Date	3/1/2023
任课教师(含负责人): Taught by	王晓强，时光，钟瑞霞，吴蕾，张晓燕，马琳		
审核人: Checked by	韩鹏	批准人: Approved by	史闻博
		批准日期: Approved Date	4/9/2023

二、教学目标 Subject Learning Objectives (SLOs)

注：毕业要求及指标点可参照悉尼学院本科生培养方案，可根据实际情况增减行数

Note: GA and index can be referred from undergraduate program in SSTC website. Please add/reduce lines based on subject.

<table>
<tr><td>整体目标:
Overall Objective</td><td colspan="2">物理学是整个自然科学和现代工程技术的基础。本课程的开设首先是使学生掌握专业所必须的物理基础知识和专业词汇；进而要让学生对物理学的内容和方法、工作语言、概念和物理图像，其历史、现状和前沿等方面，从整体上有个全面的了解。是一门培养和提高学生科学素质、科学思维方法和科学研究能力的重要基础课。
本课程涵盖力学、电磁学及光学基础知识，通过本课程的学习，要求学生能够对物理学中电磁学基础部分的概念、内容、方法、和物理图像、物理学的工作语言等方面在整体上有一个比较全面的了解，对电磁学部分系统研究的各种运动形式，以及它们之间的联系，有比较全面认识，并具有初步的应用能力。
熟练掌握矢量和微积分在物理学中的表示和应用。了解经典物理学在自然科学和工程技术中的应用，以及相关科学互相渗透的关系。

Physics is the foundation of the whole natural science and modern engineering technology. This course is designed to enable students to master the basic physics knowledge and professional vocabulary necessary for their major, and then to have a comprehensive understanding of the contents and methods, working language, concepts and physical images, history, current situation and frontier of physics. It is an important basic course to cultivate and improve students' scientific quality, scientific thinking method and scientific research ability.
This course covers the basic knowledge of mechanics, electromagnetism and optics. Through the study of this course, students are required to have a comprehensive understanding of the concepts, contents, methods, physical images and working languages of electromagnetism in physics, as well as the various forms of motion systematically studied in electromagnetism and the relationship between them, Have a comprehensive understanding and preliminary application ability.
Through the study of this course, students are required to master the expression and application of vector and calculus in physics. To enable students to understand the application of classical physics in natural science and engineering technology, as well as the relationship between related sciences.</td></tr>
<tr><td rowspan="3">（1）专业目标:
Professional Ability</td><td>1-1</td><td>掌握力学、电磁学及波动光学部分的基本概念，基本内容和基本物理图像。
Master the basic concepts, contents and physical images of mechanics, electromagnetics and wave optics.</td></tr>
<tr><td>1-2</td><td>构建恰当的物理模型，应用到经典物理学的实际问题之中。
Students can build appropriate physical models and apply them to practical problems of classical physics.</td></tr>
<tr><td>1-3</td><td>在应用高等数学描述、分析和求解经典物理学问题方面，具</td></tr>
</table>

		有一定的综合能力。 Have a certain comprehensive ability in the application of advanced mathematics to describe, analyze and solve classical physics problems.
	1-4	具备提出问题，发现问题和解决问题的能力。 Ability to ask, find and solve problems.
（2）德育目标: Essential Quality	2-1	理解物理知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the physical knowledge in depicting the practical engineering problems.
	2-2	具备一定的科学思维、科学精神和科学素质，树立科学思想以及正确的世界观和方法论。 Have a certain scientific thinking, scientific spirit and scientific quality, establish scientific thinking and correct world outlook and methodology.

课程教学目标与毕业要求的对应关系 Matrix of GA & SLOs

毕业要求 GA	指标点 GA Index	教学目标 SLOs
1、理学知识：具有扎实的物理基础，能够将物理、自然科学和专业知识用于解决复杂实际问题。 Apply knowledge of physics, natural science, fundamentals and an engineering specialization to the solution of complex engineering problems.	指标点 1-1：具有较强的演绎推理能力、准确计算能力、分析归纳能力、抽象思维能力，掌握物理、自然科学和相关专业知识，并使用其建立正确的数学、物理学等模型以解释复杂实际问题。 Capable of deductive reasoning, accurate calculation, analysis and induction and abstract thinking. Establishing correct mathematical and physical models with the professional knowledge of physics, natural science, etc. to solve complex practical problems.	1-1, 1-2，1-4
2、问题分析：能够借助物理基本原理、方法和手段，识别、表达、并通过文献研究分析复杂实际问题，以获得有效结论。 Identify, formulate, research literature and analyze complex practical problems reaching substantiated conclusions using first principles of physics and sciences.	2-1 能够应用物理、自然科学和工程学的基本原理、方法和手段，分析、识别、表达本专业相关的复杂工程问题。 Capable of analyzing, identifying and elaborating complex practical problems related to this major with the applying of the basic principles of physics.	1-2, 1-3, 2-1
	2-2 能够应用物理、自然科学和工程学的基本原理、方法和手段，针对实际复杂工程问题设计针对性的技术方案，并综合运用文献、科学理论和技术手段予以解决。 Capable of drawing on the basic principles of physics to design targeted schemes for complex practical problems, and using literature, scientific theories and technical means to solve them.	1-3, 1-4, 2-1, 2-2

三、教学内容 Content (Topics)

注：以中英文填写，各部分内容的表格可根据实际知识单元数量进行复制、扩展或缩减

Note: Filled in both CN and EN, extend or reduce based on the actual numbers of knowledge unit

(1) 理论教学 Lecture

知识单元序号: Knowledge Unit No.	1	支撑教学目标: SLOs Supported	1-1，2-1，2-2
知识单元名称 Unit Title	绪论，一维及多维运动 Introduction to physics, Kinematics in one & more-Dimension		
知识点: Knowledge Delivery	物理模型及量纲 Models in physics, Dimensional analysis		
	位移，速度及加速度 Displacement, Velocity, Acceleration		
	矢量 Vectors		
	圆周运动 Circular motion		
	相对运动 Relative motion		
学习目标: Learning Objectives	了解: Recognize	运动描述的方法 Means of motion discription	
	理解: Understand	质点运动的描述；圆周运动，运动中的两类问题，相对运动 Description of particle motion, circular motion, two kinds of problems in motion, relative motion	
	掌握: Master	描述质点运动的方法及相关物理量，圆周运动的描述，相对运动的描述 Description of particle motion and related physical quantities, description of circular motion, description of relative motion	
德育目标 Moral Objectives	2-1 理解物理知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the physical knowledge in depicting the practical engineering problems		
重点: Key Points	描述质点运动的方法及相关物理量；圆周运动 Description of particle motion and related physical quantities; circular motion		
难点: Focal points	位矢、位移、速度、加速度的矢量性；圆周运动的切向加速度和法向加速度；圆周运动的角量描述及角量与线量之间的关系；相对运动。 The vector of position vector, displacement, velocity and acceleration; tangential acceleration and normal acceleration of circular motion; angular description of circular motion and the relationship between angular quantity and linear quantity; relative motion.		

知识单元序号: Knowledge Unit No.	2	支撑教学目标: SLOs Supported	1-2，1-4
知识单元名称 Unit Title	质点动力学 Dynamics		
知识点:	牛顿定律及其应用 Newton’s Laws and Application		

Knowledge Delivery	功与能　Work and Energy	
	能量守恒定律　Conservation of Energy	
	动量与碰撞　Momentum and Collisions	
学习目标: Learning Objectives	了解: Recognize	力的概念，功与能概念，动量概念 Concept of force, concept of work and energy, concept of momentum
	理解: Understand	分析质点动力学规律的方法 The basic method of analyzing the particle dynamics
	掌握: Master	常见力和基本力；牛顿运动定律；动量定理；动量守恒定律；功、动能、动能定理；保守力、成对力的功、势能；功能原理；机械能守恒定律；碰撞 Common forces and basic forces; Newton's law of motion; momentum theorem; law of conservation of momentum; work, kinetic energy, kinetic energy theorem; work and potential energy of conservative forces and paired forces; functional principle; law of conservation of mechanical energy; collision
德育目标 Moral Objectives	2-1 理解物理知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the physical knowledge in depicting the practical engineering problems	
重点: Key Points	牛顿第二定律；动量定理；动量守恒定律；动能定理；势能；功能原理；机械能守恒定律；碰撞。 Newton's second law; momentum theorem; momentum conservation law; kinetic energy theorem; potential energy; functional principle; conservation law of mechanical energy; collision.	
难点: Focal points	牛顿第二定律微分形式的掌握；动量定理及动能定理的理论及应用；动量守恒定律、功能原理及机械能守恒定律的理解与应用；势能的概念；碰撞问题的求解。 Master the differential form of Newton's second law; theory and application of momentum theorem and kinetic energy theorem; understanding and application of momentum conservation law, functional principle and mechanical energy conservation law; concept of potential energy; solution of collision problem.	

知识单元序号: Knowledge Unit No.	3	支撑教学目标: SLOs Supported	1-2，1-3，1-4
知识单元名称 Unit Title	刚体的定轴转动　Rotational Motion About a Fixed Axis		
知识点: Knowledge Delivery	刚体模型，定轴转动概念 Rigid body, Concept of rotation motion about a fixed axis		
	角量描述，角量与线量的关系 Description of angular quantity, relationship between angular quantity and linear quantity		
	转动定律		

	Rotational theorem	
	角动量，转动动能　Angular momentum, Rotational kinetic energy	
学习目标: Learning Objectives	了解: Recognize	刚体定轴转动相关物理概念 Physical concepts related to Rotational Motion About a Fixed Axis
	理解: Understand	转动惯量的概念 Rotational inertia of a rigid body
	掌握: Master	刚体模型及其运动的描述；力矩、转动惯量及定轴转动定律；定轴转动中的功能关系；定轴转动刚体的角动量定理和角动量守恒定律。 Rigid body model and its motion description; moment, moment of inertia and fixed axis rotation law; function relationship in fixed axis rotation; angular momentum theorem and angular momentum conservation law of rigid body's rotational motion about a fixed axis.
德育目标 Moral Objectives	2-2 具备一定的科学思维、科学精神和科学素质，树立科学思想以及正确的世界观和方法论。 Have a certain scientific thinking, scientific spirit and scientific quality, establish scientific thinking and correct world outlook and methodology.	
重点: Key Points	定轴转动定律及应用；定轴转动中的功能关系；角动量定理和角动量守恒定律。 The law of fixed axis rotation and its application; the functional relationship in fixed axis rotation; the theorem of angular momentum and the law of conservation of angular momentum.	
难点: Focal points	刚体的平动和转动；力矩的概念；转动惯量的求解；定轴转动定律；刚体的转动动能；定轴转动的动能定理；定轴转动的角动量定理及角动量守恒定律。 Translation and rotation of rigid body; concept of moment; solution of moment of inertia; law of fixed axis rotation; rotational kinetic energy of rigid body; kinetic energy theorem of fixed axis rotation; angular momentum theorem and angular momentum conservation law of fixed axis rotation.	

知识单元序号: Knowledge Unit No.	4	支撑教学目标: SLOs Supported	1-2，1-3，1-4
知识单元名称 Unit Title	静电场　Electric Field		
知识点: Knowledge Delivery	电荷与静电场　Electric Charge and Electric Field		
	高斯定理 Gauss's Law		
	电势 Electric Potential		
	电容，电介质及电场能量 Capacitance; Dielectrics; Electric Energy Storage		
学习目标: Learning Objectives	了解: Recognize	库伦定律，场强与电势的微分关系 Coulomb's law, differential relation between electric	

		field strength and electric potential
	理解: Understand	理想带电体模型的电场强度和电势的物理意义，电场力做功与电势能的概念 The physical meaning of the electric field strength and potential of the ideal charged body model, and the concepts of electric field force work and electric potential energy
	掌握: Master	高斯定理，电势与电场强度的积分关系，静电平衡条件 Gauss's Law, integral relation between electric potential and electric field strength, electrostatic equilibrium condition
德育目标 Moral Objectives	2-1 理解物理知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the physical knowledge in depicting the practical engineering problems.	
重点: Key Points	库仑定律；静电场的高斯定理；电势；场强与电势的关系；静电场的导体；电容器的电容。 Coulomb's law; Gauss's Law of electric field; potential; relationship between field strength and potential; conductor of electrostatic field; capacitance.	
难点: Focal points	场强迭加原理、场强的计算；电力线、电偶极子、电位移矢量、电通量概念及应用；高斯定理；场强环路定律；电场力的功、电势、电势能、电势的计算、等势面、场强与电势的关系；导体的静电平衡条件、导体表面电荷的分布、静电屏蔽、电容、电容器、带电系统的能量、电场的能量。 Principle of superposition of electric field strength, calculation of electric field strength; concepts and applications of power line, electric dipole, electric displacement vector and electric flux; Gauss's Law; law of loop of electric field strength; work, electric potential, electric potential energy and calculation of electric potential, equipotential surface, relationship between electric field strength and electric potential; electrostatic balance condition of conductor, distribution of surface charge of conductor, electrostatic shielding, capacitance, the energy of the electric field.	

知识单元序号: Knowledge Unit No.	5	支撑教学目标: SLOs Supported	1-2，1-3，1-4
知识单元名称 Unit Title	稳恒磁场 Magnetic Field		
知识点: Knowledge Delivery	磁场的基本概念 Magnetism		
	磁场的基本性质 Basic properties of magnetic field		
	磁感应强度 B Magnetic induction		
	安培环路定理 Ampere circuital theorem		
学习目标: Learning Objectives	了解: Recognize	铁磁质 Ferromagnetic	

	理解: Understand	磁场的高斯定理，洛仑兹力及带电粒子在磁场中受力与运动的规律 Gauss's Law of magnetic field, Lorentz force, force and motion of charged particle in magnetic field
	掌握: Master	毕奥-萨伐尔定律，安培环路定理，安培定律及洛仑兹公式 Biot-Savart Law, Ampere circuital theorem, Ampere's Law, Lorentz equation
德育目标 Moral Objectives	2-1 理解物理知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the physical knowledge in depicting the practical engineering problems.	
重点: Key Points	基本磁现象、磁感应强度、磁力线、磁通量、磁场高斯定理、毕奥–萨伐尔定律及其应用、磁场强度、安培环路定律及其应用、运动电荷的磁场；安培定律、磁场对载流导线的作用、磁场对载流线圈的作用、磁力的功、平行电流间的相互作用力、“安培”的定义、洛仑兹力。 Basic magnetic phenomena, magnetic induction intensity, magnetic line, magnetic flux, Gauss's Law of magnetic field, Biot-Savart Law and its application, magnetic field intensity, Ampere circuital theorem and its application, magnetic field of moving charge; Ampere's Law, effect of magnetic field on current carrying wire, effect of magnetic field on current carrying coil, work of magnetic force, interaction force between parallel currents, definition of "ampere", Lorentz equation.	
难点: Focal points	毕奥–萨伐尔定律及其应用；稳恒磁场的安培环路定理及其应用；安培定律、磁场对载流导线及载流线圈的作用；洛伦兹力。 Biot-Savart Law and its application; Ampere circuit theorem of steady magnetic field and its application; Ampere Law, the effect of magnetic field on current carrying wire and current carrying coil; Lorentz equation.	

知识单元序号: Knowledge Unit No.	6	支撑教学目标: SLOs Supported	1-2，1-3，1-4
知识单元名称 Unit Title	电磁感应与电磁波　Electromagnetic Induction and EM Waves		
知识点: Knowledge Delivery	电磁感应　Electromagnetic Induction		
	法拉第电磁感应定律　Faraday's law		
	电感，磁场能量　Inductance; Magnetic Energy Storage		
	麦克斯韦方程组 Maxwell's Equations		
学习目标: Learning Objectives	了解: Recognize	麦克斯韦方程组积分形式，电磁波的产生及某些主要特性 The integral form of Maxwell's equations, the generation of electromagnetic wave and some main characteristics	
	理解:	感生电动势及动生电动势的意义，麦克斯韦电磁场理	

	Understand	论的两个基本假设 The meaning of induced electromotive force and motional electromotive force, two basic hypotheses of Maxwell's electromagnetic field theory
	掌握: Master	电磁感应定律，楞次定律，动生电动势 Electromagnetic induction law, Lenz law, motional electromotive force
德育目标 Moral Objectives	2-2 具备一定的科学思维、科学精神和科学素质，树立科学思想以及正确的世界观和方法论。 Have a certain scientific thinking, scientific spirit and scientific quality, establish scientific thinking and correct world outlook and methodology.	
重点: Key Points	电磁感应定律、在磁场中运动的导线内的感应电动势、转动线圈内的感应电动势和感应电流、涡旋电场、涡电流、自感应互感应、磁场能量;位移电流、麦克斯韦方程组，电磁波简介。 Law of electromagnetic induction, induced electromotive force in a wire moving in a magnetic field, induced electromotive force and induced current in a rotating coil, eddy electric field, eddy current, self induction, mutual induction, magnetic field energy; displacement current, Maxwell equations, introduction of electromagnetic wave.	
难点: Focal points	电磁感应定律及应用；动生电动势的求解；感生电场概念；自感应与互感应的概念及相关求解；位移电流的概念；麦克斯韦方程组。 Electromagnetic induction law and its application; solution of motional electromotive force; concept of induced electric field; concept of self induction and mutual induction and related solutions; concept of displacement current; Maxwell equations	

知识单元序号: Knowledge Unit No.	7	支撑教学目标: SLOs Supported	1-2，1-3，1-4
知识单元名称 Unit Title	机械振动　Oscillations		
知识点: Knowledge Delivery	弹簧振子　Oscillations of a spring		
	简谐振动方程　Motional equation of SHM		
	简谐振动的能量　Energy in SHM		
	简谐振动的叠加　Superposition of SHM		
学习目标: Learning Objectives	了解: Recognize	振动的一般概念 General concept of vibration	
	理解: Understand	简谐振动的特征及描述 Characteristics and description of SHM	
	掌握: Master	简谐振动的相关物理量，简谐振动方程，旋转矢量法及几何描述，同方向同频率简谐振动的合成 Related physical quantities of SHM, equation of SHM, rotational vector method and geometric description, composition of SHMs with the same direction and frequency	

德育目标 Moral Objectives	2-1 理解物理知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the physical knowledge in depicting the practical engineering problems.
重点: Key Points	简谐振动；旋转矢量法；同方向同频率谐振动的合成。 SHM, Rotational vector of SHM, and the composition of SHMs with the same direction and frequency.
难点: Focal points	简谐振动的特征及描述；旋转矢量图示法；同方向同频率谐振动的合成。 The characteristics and description of SHM; the graphic method of rotational vector; the composition of SHMs in the same direction and frequency.

知识单元序号: Knowledge Unit No.	8	支撑教学目标: SLOs Supported	1-2，1-3，1-4
知识单元名称 Unit Title	机械波　Wave Motion		
知识点: Knowledge Delivery	波动的概念及相关物理量　The concept of wave and related physical quantities		
	平面简谐波及波动方程　PHW, the wave equation		
	波的能量　Energy transported by waves		
	波的干涉，驻波　Superposition & interference, Standing waves		
学习目标: Learning Objectives	了解: Recognize	机械波产生条件，波的衍射现象 The conditions of mechanical wave generation and the diffraction phenomenon of mechanical wave	
	理解: Understand	周期、频率、波长、波速等的物理意义，波的能量 The physical meaning of period, frequency, wavelength and wave speed, and Energy transported by waves	
	掌握: Master	平面简谐波波动方程，波的干涉，驻波的概念及形成条件 Wave equation of PHM, interference of wave, concept and forming condition of standing wave	
德育目标 Moral Objectives	2-1 理解物理知识对于刻画工程实践问题的重要意义。 Understand the significant meanings of the physical knowledge in depicting the practical engineering problems.		
重点: Key Points	平面简谐波的概念；波动方程；惠更斯原理；波的干涉。 The concept of PHM; Wave equation; Huygens principle; Wave interference.		
难点: Focal points	简谐波的速度、波长、周期及相互关系；波动方程及其应用；波的能量、能流密度概念；惠更斯原理；波的迭加原理、波的干涉。 The velocity, wavelength, period and relationship of simple harmonic wave, wave equation and its application, the concept of energy and energy flux density of wave, Huygens principle, superposition principle and interference of wave.		

<table>
<tr><td>知识单元序号:
Knowledge Unit No.</td><td>9</td><td>支撑教学目标:
SLOs Supported</td><td>1-2，1-3，1-4</td></tr>
<tr><td>知识单元名称
Unit Title</td><td colspan="3">波动光学基础 The Wave Nature of Light</td></tr>
<tr><td rowspan="4">知识点:
Knowledge Delivery</td><td colspan="3">光的干涉条件 Interference conditions</td></tr>
<tr><td colspan="3">杨氏双缝干涉及薄膜干涉 Young's double-slit experiment, Interference in thin film</td></tr>
<tr><td colspan="3">光的衍射 Diffraction</td></tr>
<tr><td colspan="3">光的偏振 Polarization</td></tr>
<tr><td rowspan="3">学习目标:
Learning Objectives</td><td>了解:
Recognize</td><td colspan="2">惠更斯原理，麦克尔逊干涉仪原理
Huygens' principle, the principle of Michelson interferometer</td></tr>
<tr><td>理解:
Understand</td><td colspan="2">获得相干光的方法，自然光与线偏振光的概念，双折射现象
The method of obtaining coherent light, the concept of natural light and linearly polarized light, birefringence phenomenon</td></tr>
<tr><td>掌握:
Master</td><td colspan="2">光程，杨氏双缝干涉及薄膜干涉规律，夫琅禾费单缝衍射，半波带法，光栅衍射，马吕斯定律
Optical path, Young's double slit interference and thin film interference, Fraunhofer single slit diffraction, Half-wave zone method, grating diffraction, Marius law</td></tr>
<tr><td>德育目标
Moral Objectives</td><td colspan="3">2-2 具备一定的科学思维、科学精神和科学素质，树立科学思想以及正确的世界观和方法论。
Have a certain scientific thinking, scientific spirit and scientific quality, establish scientific thinking and correct world outlook and methodology.</td></tr>
<tr><td>重点:
Key Points</td><td colspan="3">相干光；双缝干涉；光程与光程差；光的衍射、惠更斯-菲涅耳原理；单缝夫琅禾费衍射；光的偏振、马吕斯定律等。
Coherent light; double slit interference; optical path and optical path difference; diffraction of light, Huygens Fresnel principle; single slit Fraunhofer diffraction; polarization of light, Marius law</td></tr>
<tr><td>难点:
Focal points</td><td colspan="3">发光机理及光的相干性；相干光的获得；干涉明暗条件；光程和光程差；薄膜干涉；劈尖干涉；牛顿环；麦克尔逊干涉仪及干涉的应用；光的衍射现象；惠更斯−菲涅尔原理；单缝的夫琅禾费衍射；衍射光栅；自然光和偏振光；起偏与检偏；马吕斯定律；反射和折射时光的偏振；光的双折射。
Luminescence mechanism and coherence of light; acquisition of coherent light; interference condition; optical path and optical path difference; thin film interference; wedge interference; Newton ring; Michelson interferometer and application of interference; diffraction phenomenon of light; Huygens Fresnel principle; Fraunhofer single slit diffraction; diffraction grating; natural light and polarized light; polarization initiation and detection; Marius law; Polarization characteristics of reflection and refraction light; birefringence of light.</td></tr>
</table>

(2) 实验教学 Experiments

注：可根据实际情况增减行数。实验类型可分为验证性、设计性、综合性，实验性质可分为选做、必做。

Note: Please add/reduce lines based on subject. The Type contains Verify, Design, and Comprehensive, while the Pattern contains Required and Elective

序号 No.	实验项目名称 Experiment Topic	学时 Hours	每组人数 MPG*	实验类型 Type	实验性质 Pattern
1					
2					
3					
4					
5					
6					
	总计 Total				

*MPG: Members per group

实验项目序号: Experiment No.	选择一项。	支撑教学目标: SLOs Supported	
每组成员: Members per Group		指导教师: Tutor	
实验名称: Experiment Title			
实验内容: Content			
学习目标: Learning Objectives			
教学要求: Requirements			
实验场地: Location			
实验软硬件设备: Software/Hardware			

(3) 课外实践教学 PBL

PBL 项目序号: PBL No.		支撑教学目标: SLOs Supported	
项目名称: PBL Title			
每组成员: Members per Group		指导教师: Tutor	
学时 Hours		成果物 Achievements	
项目内容: Content			
学习目标: Learning Objectives			
教学要求: Requirements			
实践场地: Location			
实践软硬件设备: Software/Hardware			

四、教学安排 Teaching Schedule

注：可根据实际情况增减行数

Note: Please add/reduce lines based on subject.

教学内容 Teaching Content	学时(周) Hour(Week)			
	理论 LECT.	实验 EXP.	课外实践 PBL	集中实践 PRAC.
绪论，一维及多维运动 Introduction to physics, Kinematics in one & more-Dimension	3			
质点动力学 Dynamics	7			
刚体的定轴转动 Rotational Motion About a Fixed Axis	6			
静电场 Electric Field	14			

稳恒磁场　Magnetic Field	13			
电磁感应与电磁波 Electromagnetic Induction and EM Waves	13			
机械振动　Oscillations	3			
机械波　Wave Motion	1			
波动光学基础　The Wave Nature of Light	12			
总计 Total	72			

五、教学方法 Teaching Methodology

注：可根据实际情况增减行数或修改内容

Note: Please add/reduce lines or revise content based on subject.

勾选 Check	教学方法与特色 Teaching Methodology & Characters
☑	多媒体教学：基于信息化设备的课堂教学 Multi-media-based lecturing
☐	实践能力传授：理论与行业、实际案例相结合 Combining theory with industrial practical problems
☑	课程思政建设：知识讲授与德育相结合 Knowledge delivery with ethic education
☐	PBL 教学：问题驱动的分组学习与交流 Problem-based learning
☐	其他:单击或点击此处输入文字。 Other:单击或点击此处输入文字。

六、成绩评定 Assessment

注：可根据实际情况增减行数或修改内容

Note: Please add/reduce lines or revise content based on subject.

考核环节: Assessment Content	平时 Behavior	环节负责人: Director	王晓强，时光
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	30
考核方式: Measures	满分 100 分，使用线上教学平台及学习通记录学生平时的课堂表现，每次考勤计 10 分，缺勤不得分，缺勤五次及以上取消考试资格，占平时成绩的 30%。每次作业计 10 分，抄袭、给他人抄袭或未交作业不得分，占平时成绩的 40%。力学部分、电磁学部分及波动光学部分内容授课结束后，分别有一次学习通线上 quiz，每次 quiz 计 10 分，总体占平时成绩的 30%。最后总分不超过 100 分，不低于 0 分。		

考核环节: Assessment Content	期中 Mid-term	环节负责人: Director	王晓强，时光
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	10
考核方式: Measures	满分 100 分，通过超星学习通在线开卷期中考试并记录学生成绩，抄袭、给他人抄袭不得分。		

考核环节: Assessment Content	期末 Final	环节负责人: Director	王晓强，时光
给分形式: Result Type	百分制 Marks	课程总成绩比重(%): Percentage (%)	60
考核方式: Measures	满分 100 分，通过批阅期末考试试卷给出学生成绩。		

七、改进机制 Improvement Mechanism

注：未尽事宜以教学团队以及学院教学指导委员会商定为准。

Note: Matters not covered in this file shall be determined by TAB of SSTC, NEU.

教学大纲改进机制 Subject Syllabus Improvement Mechanism			
考核周期(年): Check Period (YR)	4	修订周期(年): Revise Period (YR)	4
改进措施: Measures	课程负责人根据课程教学内容与人才培养目标组织课程团队讨论并修改教学大纲，报分管教学工作副院长审核后由执行院长批准。 The subject coordinator shall be responsible for the syllabus discussion and improvement, and the revised version shall be submitted to deputy dean (teaching affairs) for reviewing then to executive dean for approvement.		
成绩评定改进机制 Assessment Improvement Mechanism			
考核周期(年): Check Period (YR)	1	修订周期(年): Revise Period (YR)	1
改进措施: Measures	课程负责人根据课程教学内容、课堂教学效果以及成绩分布，对课程教学方法和成绩评定环节进行改进，并同步优化评定办法。 The subject coordinator shall revise the syllabus based on the teaching		

	content, effect and result distribution while optimize the assessment measures.