

复旦大学《大学物理》（4 学分）教学大纲

课程代码	219. 122. 1-2	编写时间	2007 年 4 月
课程名称	大学物理（4 学分）		
英文名称	University Physics		
学分数	4+4	周学时	4+1, 4+1
任课教师*		开课院系**	物理系
预修课程	高中数学物理		
课程性质： 本课程是针对自然科学类具有一定物理基础并对物理学有强烈兴趣的学生开设的基础物理课程。			
教学目的： 通过本课程的学习，掌握物理学的基本知识和基本理论，为进一步学习其他物理课程打下坚实基础。 内容包括：普通物理的基本知识。经典物理的力学、热学、电磁学、波动学与光学的基本规律。 要求学生全面理解普通物理的基础知识，掌握自然界已成熟的自然规律。通过一些演示实验达到对物理现象、物理规律和物理概念更具体、更生动、更清晰的理解。从其发展过程，学习物理学分析问题的方法和科学态度，逐步培养在学习和工作中发现问题，提出问题，思考问题，解决问题和获取新知识的能力。			
教材和教学参考资料：			
作者	教材名称	出版社	出版年月
S. Halliday	Physics	John Wiley & Sons	2000 年
Feynman, Leighton, Sands	费恩曼物理学讲义	上海科学技术出版社	2005 年 6 月
郑永令, 贾起民, 方小敏	力学（第二版）	高等教育出版社	2002 年 8 月第 2 版
李洪芳	热学（第二版）	高等教育出版社	2001 年 1 月 第 2 版
贾起民, 郑永令, 陈暨耀	电磁学（第二版）	高等教育出版社	2001 年 1 月 第 2 版
章志鸣, 沈元华, 陈惠芬	光学（第二版）	高等教育出版社	2000 年 6 月第 2 版
教学进度安排： 第一学期： Week 1st Chapter 1: Measurement Section 1-2 1-3 1-4: The standard of time, Length and mass Section 1-6: Precision and significant figures Chapter 2: Motion in one dimension			

Section 2-1 2-2 2-3: Position, velocity and acceleration vectors

Section 2-4 2-5 2-6: Motion with constant acceleration

Week 2nd

Chapter 3: Force and Newton's Laws

Section 3-1 3-2: Newton's first law

Section 3-3 3-4: Mass and force

Section 3-5 3-6: Newton's second law; Newton's third law

Section 3-7 3-8: Applications of Newton's law in one dimension

Chapter 4: Motion in two and three dimensions

Section 4-1 4-2 4-3: Projectile motion

Week 3rd

Section 4-4: Drag force

Section 4-5: Uniform circular motion

Section 4-6: Relative motion

Chapter 5: Applications of Newton's laws

Section 5-1 5-2: Forces

Section 5-3 5-4: The dynamics of uniform circular motion

Section 5-6: Noninertial frames and pseudo forces

Week 4th

Chapter 6: Momentum

Section 6-1 6-2 6-3: Impulse and momentum

Week 5th

Chapter 6

Section 6-4: Conservation of momentum

Section 6-5: Two-body collisions

Chapter 7: Systems of particles

Section 7-1 7-2 7-3: Many-particle systems

Section 7-4: Center of mass of solid objects

Section 7-5: Conservation of momentum in a system of particles

Section 7-6*: Systems of variable mass

Week 6th

Chapter 8: Rotational kinematics

Section 8-1 8-2 8-3: Rotational motion and rotational variables

Section 8-4 8-5 8-6: Vector relationships between linear and angular variables

Week 7th

Chapter 9: Rotational dynamics

Section 9-1 9-2 9-3: Rotational inertial and Newton's second law

Section 9-4 9-5 9-6 9-7: Combined rotational and translational motion

Chapter 10: Angular momentum

Section 10-1 10-2: Angular momentum

Section 10-3 10-4: Conservation of angular momentum

Section 10-5: The spinning top

Week 8th

Chapter 11: Energy 1: work and kinetic energy

- Section 11-1 11-2 11-3: Work and power
- Section 11-4 11-5: Work done by a variable force
- Section 11-6 11-7: Kinetic energy and work-energy theorem
- Section 11-8: Kinetic energy in rotational motion

Chapter 12: Energy 2: potential energy

- Section 12-1: Conservative forces
- Section 12-2: Potential energy
- Section 12-3 12-4: Conservation of mechanical energy
- Section 12-5 12-6: Conservative system

Week 9th

Chapter 13: Energy 3: conservation of energy

- Section 13-1 13-2: Internal energy
- Section 13-3 13-4: Conservation of energy in a system of particles
- Section 13-5: Center-of-mass energy
- Section 13-6: Energy transfer by heat

Chapter 14: Gravitation

- Section 14-1 14-2 14-3: Newton's law of universal gravitation

Week 10th

Chapter 14: Gravitation

- Section 14-4 14-5 14-6: Gravitational potential energy
- Section 14-7: The motion of planets

Chapter 15: Fluid statics

- Section 15-1: Fluid and solid
- Section 15-2 15-3: Pressure
- Section 15-4: Pascal's principle and Archimedes' principle
- Section 15-5: Measurement of pressure

Week 11th

Chapter 16: Fluid dynamics

- Section 16-1 16-2: The equation of continuity
- Section 16-3: Bernoulli's Equation
- Section 16-4: Applications of Bernoulli's Equation

Chapter 17: Oscillations

- Section 17-1 17-2 17-3: The simple harmonic motion
- Section 17-4: Energy
- Section 17-5: Application of SHM
- Section 17-6: SHM and uniform circular motion
- Section 17-7: Damped harmonic motion

Week 12th

- Section 17-8: Forced oscillation

Chapter 18: Wave motion

- Section 18-1 18-2: Types of waves
- Section 18-3: Traveling waves
- Section 18-4 18-5: The wave equation
- Section 18-6: Energy in wave motion

Section 18-7 18-8: Interference of waves

Section 18-9 18-10: Standing waves

Week 13th

Chapter 19: Sound waves

Section 19-1: Properties of sound waves

Section 19-2 19-3: Traveling sound waves

Section 19-4: Power and intensity of sound waves

Section 19-5 19-6: Interference of sound waves

Section 19-7: Source of sound

Section 19-8 19-9: The Doppler effect

Week 14th

Chapter 20 The special theory of relativity

Section 20-1 20-2: The postulates of special relativity

Section 20-3: Consequences of Einstein's postulates

Section 20-4: The Lorentz transformation

Section 20-5: Space-time coordinates

Week 15th

Section 20-6: The transformation of velocities

Section 20-7 20-8 20-9: Relativistic momentum and energy

Chapter 21: Temperature

Section 21-1 21-2: Temperature and thermal equilibrium

Section 21-3: Measuring Temperatures

Section 21-4: The ideal gas

Week 16th

Chapter 22: Molecular properties of gases

Section 22-1: The atomic nature of matter

Section 22-2: A molecular view of pressure

Section 22-3 22-4: The distribution of molecular speeds and energies

Section 22-5: Equation of state for real gases

Chapter 23: The first law of thermodynamics

Section 23-1: The transfer of heat

Section 23-2: The first law of thermodynamics

Section 23-3: Heat capacity

Section 23-4: Work done by an ideal gas

Section 23-5: The internal energy of an ideal gas

Section 23-6: Applications of first law

Week 17th

Chapter 24: The second law of thermodynamics

Section 24-1: One-way processes

Section 24-2: Defining entropy change

Section 24-3: Entropy change for irreversible processes

Section 24-4: The second law of thermodynamics

Section 24-5: The efficiencies of real engines

Section 24-6: A statistical view of entropy

第二学期:

Week 1st

Chapter 25 Electric charge and Coulomb's law

Chapter 26 Electric field

Section 26-1~Section 26-7 A Dipole in an electric field

Week 2nd

Section 26-8 The nuclear model

Chapter 27 Gauss' Law

Chapter 28 Electric potential energy and potential

Section 28-1~Section 28-3 Electric potential

Week 3rd

Section 28-4 Calculating the potential from the field

~ Section 28-9 The potential of a charged conductor

Chapter 29 The electrical properties of materials

Section 29-1~Section 29-5

Ohm's Law: A microscopic view

Week 4th

Section 29-6 An insulator in an electric field

Chapter 30 Capacitance

Chapter 31 DC circuits

Section 31-1 electric current

~Section 31-5 Resistors in series and parallel

Week 5th

Section 31-6 Energy transfer in an circuit

Section 31-7 RC circuits

Chapter 32 The magnetic field

Section 32-1 ~ Section 32-6

The torque on a current loop

Week 6th

Chapter 33 The magnetic field of a current

Section 33-6 Electromagnetism and frames of reference

Chapter 34 Faraday's experiments

Section 34-4 Motional emf

Week 7th

Section 34-5 Generators and motors

Section 34-6 Induced electric field

Chapter 35 Magnetic properties of materials

Week 8th

Chapter 36 Inductance

*Section 36-7 Damped and forced oscillations

Chapter 37

Section 37-1 Alternating currents ~

Section 37-4 power in Ac Circuits

	*Section 37-5 The transformer
Week 9th	
Chapter 38	Maxwell' s equations
	*Section 38-7 Radiation pressure
Week 10th	
Chapter 39	Light waves
	Section 39-2 Visible light ~
	Section 39-5 Total internal reflection
	*Section 39-6 The Doppler effect for light
Chapter 40	Mirrors and Lenses
Week 11th	
Chapter 41	Interference
Chapter 42	Diffraction
	Section 42-1 ~ Section 42-3
	Intensity in single-slit diffraction
Week 12th	
Section 42-4	Diffraction at a circular diffraction
	Section 42-5 Double-slit interference and diffraction combined
Chapter 43	Gratings and spectra
	*Section 43-5 Holography
Week 13th	
Chapter 44	Polarization
	*Section 44-6 Polarization by scattering
Chapter 45	The nature of light
Week 14th	
Chapter 46	The nature of matter
	*Section Schrödinger's equation
Week 15th	
	Section 47-1 ~ Section 47-7
	An electron trapped
	An excited state of the Hydrogen Atom
Week 16th	
*Chapter 48	Atomic structure
	Section 48-1 The x-ray spectrum of Atoms
	Section 48-3 Building Atoms
	Section 48-4 The periodic Table
Week 17th	
*Chapter 49	Electrical Conduction in Solids

作业和考核方式:

每周布置一次作业, 最后考核成绩平时作业占 30%, 期末考试占 70%。