南京航空航天大学
Nanjing University of Aeronautics and Astronautics

Syllabus

Course No.	1900826W	**College**	Science	**Dept.**	Applied Physics
Teacher	Fengming Pan				
Time	2023.06.12-2023.07.14				
Course Name	**English**	Classical Physics A with lab			
	Chinese	经典物理 A			
Course hours	**Total**	**Theory**	**Office Hour or Practice**	**Credits**	
	70	60	10	4.0	

Course description: Describe the nature, academic status, and aims of the course (theory, ability and technique)

1. Course nature and academic status

This course provides an introduction to classical mechanics, which was the first branch of physics to be discovered, and is the foundation upon which all other branches of physics are built. Moreover, classical mechanics has many important applications in other areas of science, such as Astronomy (e.g., celestial mechanics), Chemistry (e.g., the dynamics of molecular collisions), Geology (e.g., the propagation of seismic waves, generated by earthquakes, through the Earth's crust), and Engineering (e.g., the equilibrium and stability of structures). In our study of classical mechanics we will first go over some important preliminaries needed throughout this course like units, error analysis and vectors. We will be concerned with analyzing different types of motion including linear, circular, rotational and oscillation motion. And we will discuss how Newton's laws and the concepts of energy and momentum can be applied. Gravitation and planetary motion is also covered by the course.

2. Course aims (theory, ability and technique)

As the result of instructional activities, students will be able to:

1. Analyze the motion of objects moving in a straight line.
2. Perform vector arithmetic.
3. Apply vector arithmetic to the analysis of two dimensional motion.
4. State and apply Newton's Laws.
5. Calculate centripetal acceleration and centripetal force, and apply these concepts to the solution of problems.
6. State and apply Newton's Law of gravitation and planetary motion.

7. Define work and energy and apply these concepts to the solution of problems
8. Explain impulse and momentum and apply these concepts to the solution of problems.
9. Analyze the motion of rotational object by applying the equations of rotational kinematics and dynamics.
10. State and apply the first and second conditions of equilibrium to objects that are at rest.

Requirements for courses; ability and knowledge in advance

A college physics course requires more than just a curious scientific mind. Before taking this course you likely will need some basic algebra, geometry and possibly pre-calculus coursework. A background of high school physics is strongly suggested. If English is a second language for you, keep a glossary of new terms that you encounter and make sure you understand how they are used in physics.

Course structure explanation:
Make clear the necessary parts, optional parts, distribution of hours. Courses with experiments or practice are expected to explain credit hours needed, content, scheme and functions.

Newton's laws
Newton's laws, motion in more than one dimension.
Application of Newton's laws
2 Momentum.
Rotational kinematic and dynamics
Rotational dynamics
3 Angular momentum. Kinetic Energy and Work.
Kinetic Energy and Work.
Potential Energy, Kinetic energy in reference frames, conservation of energy.
4 Gravitation
Fluid statics
Simple Harmonic Motion
5 Review

1. Introduction (2 hrs.)
    a) What is physics and how it relates to other fields
    b) units and vector operation
    c) Orders of magnitude
2. Kinematics in one dimension (1 hrs.)
    a) Speed, velocity and displacement
    b) Frames of reference
    c) Acceleration
    d) Free falling motion
3. Kinematics in two dimensions (2 hrs.)
    a) Adding vectors using graphical techniques
    b) Using analytical methods for adding vectors
    c) projectile motion

4. Newton’s laws (5 hrs.)
    a) Force
    b) Newton's Laws of motion
    c) Applications
5. Linear Momentum (3 hrs.)
    a) Momentum and Force
    b) Conservation of Momentum
    c) Collision and impulse
    d) Center of mass (optional)
6. Circular Motion (4 hrs.)
    a) Kinematics of circular motion
    b) Dynamics of circular motion
    c) Gravitation
    d) Planetary motion (optional)
7. Rotational Motion (6 hrs.)
    a) Angular quantities
    b) Kinematics for uniformly accelerated rotational motion
    c) Torque
    d) Rotational Dynamics
    e) Rotational Kinetic Energy (optional)
    f) Angular momentum
8. Bodies in Equilibrium (3 hrs.)
    a) Statics and equilibrium
    b) Statics problems
9. Work and Energy (4 hrs.)
    a) Work
    b) Kinetic energy
    c) Potential energy
    d) Conservation of energy
    e) Power
10. Vibrations and waves (5 hrs.)
    a) Simple Harmonic Motion
    b) The pendulum
11. Fluid statics (5 hrs.)
12. Review and self-study (10 hrs.)

Teaching methods (Lectures, practice, etc)

Lectures and self-study

Forms of evaluation and requirements
Structure of the final grade(including presence, class performance,), focus of exam, forms of exam(test, interview, final report, etc)

The methods of evaluation shall include:
Homework & class performance (20%)
Labs (30%)
Final Exam (50%)

Textbook	**Name**	**Publisher**	**Author**	**Year**	**Price**
	Physics For Scientists and Engineers		Serway and Beichner	5th Editi on	
References	**Name**	**Publisher**	**Author**	**Year**	**Price**
	University Physics	China Machine Press	Hugh D. Young	2010	169RMB
Website					
Course members					
College					