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Syllabus of Integrated F=ma + USAPhO Training Course [1]

PROFESSOR CHEN EDUCATION PALACE

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OBJECTIVES

We expect students to achieve the following objectives after taking this course:

1. Qualify for USAPhO through F=ma.
2. Perform well in USAPhO, such as qualifying for the IPhO training camp or receiving a gold medal in USAPhO.

PREREQUISITES

1. Prerequisites in physics: AP Physics 1. We presume students have finished studying AP Physics 1 before taking our training course.
2. Prerequisites in math: AP Calculus AB. We presume students know how to do single-variable calculus. If a student does not have this background before taking our training course, we recommend the student to simultaneously study calculus while taking our course.

DURATION

This is a 40-hour course.

TEXTBOOKS

We use our own course packet developed by Professor Chen Education Palace.

TEACHING PLATFORM

We use Zoom for teaching. We provide recordings to our students.

COURSE CONTENTS

Module 1: Background preparation

1. Dimensional analysis
2. Uncertainty calculation and analysis

Module 2: Mechanics

1. Kinematics
2. Statics
3. Dynamics
4. Non-inertial reference frames
5. Energy, linear momentum, angular momentum
6. Oscillations
7. Fluids

Module 3: Special relativity

1. Relativistic kinematics
2. Relativistic dynamics

Module 4: Electromagnetism

1. Maxwell's equations, Lorenz force
2. Electrostatics
3. DC Circuits
4. Magnetism
5. Electromagnetic induction

6. RLC and AC circuits

Module 5: Thermodynamics

1. Thermodynamics and ideal gases
2. The second law of thermodynamics
3. Heat transfer and phase transition

Module 6: Optics

1. Geometrical optics
2. Waves