Objectives for Physics Majors

A student graduating from Oberlin College with a major in physics will possess:

A knowledge of physics. The student will:

- have a qualitative grasp of the way things work (e.g., force is related to acceleration, a magnetic field is associated with a changing electric field, confined particles have quantized energies);
- know the basic laws of physics and their range of application (e.g., Maxwell's equations, conservation of momentum, the Schrödinger equation);
- understand experimental evidence for the basic laws and the role of measurement in science;
- have a general awareness of what fields of physics are the subject of current investigation;
- know career paths that are available with a bachelor's degree in physics.

Problem-solving skills. The student will be able to:

- identify important concepts and ignore irrelevant data;
- use simple techniques (e.g., dimensional analysis, limiting cases, symmetry, back-of-the-envelope estimates), both as rough solutions and as tests of more detailed solution techniques;
- use physical intuition to guess the character of a solution without solving the problem;
- translate physical concepts into mathematical language;
- use sound reasoning and detect flaws in logic;
- use computer skills such as symbolic and numerical analysis, write simple programs, and know when a computational approach is appropriate;
- carry out detailed solutions (e.g., solving algebraic, differential, and integral equations).

Experimental skills. The student will be able to:

- take measurements of physical phenomena (e.g., electrical, magnetic, and/or optical signals);
- use equipment (e.g., vacuum systems, cryostats) to control experimental conditions;
- understand and take necessary safety precautions;
- document experimental results;
- design experiments, including developing procedures for optimal data collection;
- analyze data using relevant curve fitting and error analysis methods.

Communication skills. The student will be able to:

- present physics to technical and non-technical audiences;
- write technical papers that are accurate, clear, and concise;
- locate, evaluate, and use appropriate electronic and print resources;
- convey information using graphs, drawings, and pictures.

Computational skills. The student will be able to:

- assess when a computational approach is appropriate;
- write short codes or use packaged software to apply numerical approaches;
- understand the algorithms that underlie these numerical methods;
- debug simple computer programs and test them against analytical solutions and expected qualitative behavior;
- use symbolic tools like Mathematica to perform complex algebraic manipulations (e.g., simplify expressions, find roots, and integrate).

Objectives for Students Majoring in Another Science

Through taking an introductory course in the physics and astronomy department, students will:

- become acquainted with the major subfields of physics;
- gain a sufficient knowledge to understand applications of physics in their major field;
- acquire a basis for more advanced study of physics concepts needed in their major field;
- advance their problem-solving skills;
- develop skills in making elementary laboratory measurements, especially electrical ones.

Objectives for Students Not Majoring in a Science

By taking a physics or astronomy course, a student will:

- acquire a basic understanding of some fundamental laws of nature (e.g., the first and second laws of thermodynamics or Newton's laws of mechanics) and how they may be used to understand real-world phenomena;
- understand that science involves reasoning from observations and experiments, and appreciate the character and limitations of science;
- practice applying logic and quantitative reasoning;
- begin to appreciate the beauty, elegance, and economy of scientific explanations.

Adopted November 24, 2005