

PHYSICS

Physics is the most basic of the natural sciences and as such, strengthens the professional preparation of biologists, chemists, mathematicians, and curious intellectuals. Physics is about the nature of motion, forces, energy, matter, heat, sound, light, and the structure of atoms. The study of physics provides an ideal foundation to better understand the fields of chemistry, biology, mathematics, and many others.

A minor in physics is intended to provide an in-depth study of physics for non-physics majors entering into a global and diverse workforce where a multidisciplinary science background is increasingly required. It will also serve those students who, through elective physics course studies, develop a greater interest in the discipline, or who plan to enter graduate school in an area where a strong physics background is useful or required.

The objective of the minor is to strengthen the student's knowledge of the fundamental physical concepts underlying all of modern science and engineering. The minor will help the student develop analytical problem-solving skills and reinforce the student's ability to engage in scientific thinking. The Physics minor is useful for students in many STEM disciplines who wish to extend their studies in this fundamental field and as a background for graduate study or work in a variety of technical fields.

Students may pursue a physics major through an agreement with the Associated Colleges of the Twin Cities (<http://catalog.stkate.edu/undergraduate/special-academic-programs/associated-colleges-twin-cities/>), details to be found in the Special Academic Programs section of this catalog. Discussion with the Division Chair is also required.

This minor is offered in the College for Women only.

Curriculum

| Code | Title | Credits |
|--|----------------------------------|-----------|
| Required courses: | | |
| PHYS 1110 | Introductory Physics I with Lab | 4 |
| PHYS 1120 | Introductory Physics II with Lab | 4 |
| PHYS 2250 | Modern Physics | 4 |
| Choose two of the following (one must be at the 3000 or 4000 level): | | 8 |
| CHEM 3310 | Physical Chemistry I with Lab | |
| PHYS 1040 | Astronomy with Lab | |
| PHYS 4022 | Medical Physics | |
| Or other courses approved by the department chair | | |
| Total Credits | | 20 |

| Code | Title | Credits |
|-----------------------------|-------------|----------|
| Required Supporting Courses | | |
| MATH 1130 | Calculus I | 4 |
| MATH 1140 | Calculus II | 4 |
| Total Credits | | 8 |

PHYS 1040 Astronomy with Lab – 4 credits

This course provides an introduction to the physical principles and processes of science applicable to the study of astronomy. This study is largely observationally based utilizing the University's astrophysical observatory with a computerized telescope and research instrumentation. Topics include a study of the solar system, the earth and moon system, stellar structure and evolution, giants, dwarfs, pulsars and black holes, nebulae, galaxies, quasars, cosmology and the search for extraterrestrial life. Four lectures and two laboratory hours per week.

PHYS 1050 Conceptual Physics – 4 credits

This conceptual physics course will cover a wide variety of topics that may include: motion and forces, energy and gravity, sound and light, electricity and magnetism, vibrations, fluids and thermodynamics. While these topics themselves are important, they will also be providing a context for developing and honing problem-solving skills. Such skills are applicable in almost any field, including medical, scientific, teaching, or technological occupations. The course is intended for those students who have not had a recent course, or any course in high school or college physics. Basic algebra skills are needed for success in this course. Offered in the College for Women.

Prerequisite: Appropriate score on mathematics placement assessment.

PHYS 1080 Physics for the Health Sciences I with Lab – 4 credits

This course and its continuation, PHYS 1090, is designed especially for physical therapy and related studies requiring only algebra-based physics. The first semester focuses on applications of mechanics and thermodynamics to the human body and physical agent modalities. Four hours of lecture and two laboratory hours per week. Offered in the College for Women.

Prerequisite: MATH 1090 with a minimum grade of C- or appropriate level on mathematics placement assessment.

PHYS 1090 Physics for the Health Sciences II with Lab – 4 credits

This is a continuation of PHYS 1080. This course focuses on electric and magnetic fields, circuits, wave theory, optics and modern physics including medical imaging. Offered in the College for Women.

Prerequisite: Grade of C- or better in PHYS 1080.

PHYS 1110 Introductory Physics I with Lab – 4 credits

This course and its continuation, PHYS 1120, are intended for pre-medicine, physical and life science, mathematics and pre-engineering students. The principles of classical mechanics, vectors, kinematics, particle and rigid body rotational dynamics and statics; conservation laws; fluid mechanics and thermodynamics. Four hours of lecture and two laboratory hours per week. Offered in the College for Women.

Prerequisite with concurrency: MATH 1130.

PHYS 1120 Introductory Physics II with Lab – 4 credits

This is a continuation of PHYS 1110. The principles of thermal, wave, optical and electromagnetic phenomena with an introduction to modern physics are studied. Four hours of lecture and two laboratory hours per week. Offered in the College for Women.

Prerequisite: Grade of C- or better in PHYS 1110.

Prerequisite with concurrency: MATH 1140.

PHYS 2250 Modern Physics – 4 credits

The course will look at the historical context driven by experimental work with the atom. We will look at the physics of relativity, atomic physics, wave mechanics, nuclear physics and introductory quantum mechanics.

Prerequisites: PHYS 1120 and MATH 1140 with a minimum grade of C.

Recommended: Prior completion of or concurrent registration with MATH 2060.

PHYS 2994 Topics – 4 credits

The subject matter of the course is announced in the annual schedule of classes. Content varies from year to year but does not duplicate existing courses. Offered in the College for Women.

PHYS 4022 Medical Physics – 4 credits

This course will cover different radiation therapy/medical physics applications. This will include ongoing discussion of x ray production and medical imaging such as CT, PET and MRI. This course will instruct students in the aspects of central axis, 2D and 3D dose distribution. Concepts related to dose calculation and the calibration of megavoltage treatment units will be discussed. Students will learn to apply the principles of physics discussed in their respective programs in the areas of monitor unit calculations and external beam treatment planning, brachytherapy, and special procedures. Also offered under RTT 4022. Prerequisites for PHYS students: PHYS 1110, PHYS 1120, PHYS 2250, MATH 1140. Prerequisites for RTT students: RTT 3010, RTT 3015, RTT 3020 or 3022, RTT 3025, RTT 3030, RTT 3035.