

PHYSICS - MINOR

Physics is the most basic of the natural sciences and as such, strengthens the professional preparation of biologists, chemists, and curious intellectuals. Physics is about the nature of motion, forces, energy, matter, heat, sound, light and the structure of atoms. Chemistry is about how atoms form molecules and how molecules make up matter. Biologists study matter that is alive. So the study of physics provides an ideal foundation to better understand these fields 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.

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.

This minor is offered in the College for Women only.

Curriculum

Code	Title	Credits
Required courses:		
PHYS 1110	Introductory Physics I	4
PHYS 1120	Introductory Physics II	4
PHYS 2250	Modern Physics	4
Choose two of the following (one must be at the 3000 or 4000 level):		8
PHYS 1040	Astronomy with Lab	
PHYS 1400	Introduction to Engineering	
PHYS 2XXX	Physics of Music	
PHYS 4022	Medical Physics	
PHYS 4XXX	Biophysics	
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. Also offered in Evening/Weekend/Online Program.

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 – 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 – 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 – 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 1200 Engineering in Your World with Lab – 4 credits

Most of the world we experience everyday is human made or engineered. Engineers create products from indoor plumbing to airplanes that make our lives more comfortable and convenient. This course is an introduction to the engineering concepts associated with products in your everyday life, including structures, machines and mechanisms, hydraulics and pneumatics, and electricity. Classes are a mixture of mini-lectures about concepts and associated calculations, experiments to solidify concepts, discussions to generalize concepts to other technologies, and projects to apply the concepts to new problems. This course meets the liberal arts core requirement for lab science.

PHYS 1400 Introduction to Engineering – 4 credits

Introduction to Engineering is an introductory course that requires no prior knowledge of physics or engineering. Students will develop skills critical for practicing engineers including disciplinary content and familiarity with the engineering design process. Course includes extensive exposure to visual, written and oral communication forms, and to computer-based design tools. Substantial design projects, including prototype construction, project management; teamwork and reviews are included.

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 2684 Directed Study – 4 credits**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.

PHYS 4684 Directed Study – 4 credits

Directed study is provided for students whose unusual circumstances prohibit taking a regularly scheduled course but who need the material of that course to satisfy a requirement. Availability of this faculty-directed learning experience depends on faculty time and may be limited in any given term and restricted to certain courses.

Prerequisites: Faculty, department chair and dean approval.

PHYS 4912 Research – 2 credits

Research-based learning experience designed in collaboration with a faculty member.

Prerequisites: Faculty and department chair approval.

PHYS 4994 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.