

PHYSICS, MINOR

Program Description

Introduction

A minor in physics is offered for students who are interested in a broad foundation in classical and modern physics. For students majoring in physical sciences, geographic information science, engineering and technology, the physics minor offers a solid foundational base in the application of fundamental physical laws in their disciplines. It provides training in computation and applied mathematics for computer science and mathematics students.

Substitutions

Students majoring in technical areas may ask the Physics faculty to support a Degree Plan Exceptions Form to list Course Substitutions in their pursuit of a physics minor. Possibilities include:

- EEEN 3310 Electromagnetic Theory (3 sch) for PHYS 3332 Electromagnetism (3 sch)
- ENGR 3316 Thermodynamics (3 sch) for PHYS 3333 Thermodynamics (3 sch)
- MATH 4315 Partial Differential Equations (3 sch) for PHYS 4330 Mathematical Methods for Physicists (3 sch)

Program Requirements

Code	Title	Hours
Required Courses		
PHYS 2425	University Physics I	4
PHYS 2426	University Physics II	4
Select 12-13 hours of upper-level physics courses of the following: ¹ 12-13		
PHYS 3334	Modern Physics I [^]	
PHYS 3331	Mechanics I [^]	
PHYS 3332	Electromagnetism [^]	
PHYS 3333	Thermodynamics [^]	
PHYS 4330	Mathematical Methods for Physicists [^]	
PHYS 4335	Quantum Physics [^]	
PHYS 4337	Nuclear Physics [^]	
PHYS 4340	Advanced Physics Lab [^]	
PHYS 3490	Selected Topics [^]	
Total Hours		20-21

1

The upper-level physics courses are offered from one of the members of the Texas Physics Consortium (possibly from TAMUCC) via live two-way video conference.

[^]

Blended offering

Prerequisites

Students pursuing a minor in physics may need to take one or more of the following prerequisite courses:

Code	Title	Hours
MATH 2413	Calculus I	4
MATH 2414	Calculus II	4

MATH 2415	Calculus III	4
MATH 3315	Differential Equations	3

Courses

PHYS 1303 Introduction to Astronomy: Stars and Galaxies 3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)

This is one of two courses in the introduction to astronomy sequence which emphasizes the nature of astronomical phenomena over the mathematical analysis of them. This course will focus mostly on the nature of light, the nature and evolution of stars, the material between the stars, the Milky Way Galaxy, external galaxies, and the structure and evolution of the universe as a whole. Fall.

Co-requisite: SMTE 0095.

TCCNS: PHYS 1303

PHYS 1304 Introduction to Astronomy: Solar System 3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)

This is one of two courses in the introduction to astronomy sequence which emphasizes the nature of astronomical phenomena over the mathematical analysis of them. This course introduces astronomical phenomena related to the Solar System such as apparent motion of the Sun, phases of the Moon and apparent and true motion of the planets. Main focus will be on the objects comprising the Solar System: planets, their moons, asteroids, comets and trans-Neptunian bodies. A portion of the course will be dedicated to the formation and development of the Solar System and other, extrasolar planetary systems. The course also will touch the aspects of human exploration of the Solar System and the role of technology in our learning and understanding of the Solar System. This includes the history and the basics of robotic and manned spaceflights. Offered every Spring and Summer.

Co-requisite: SMTE 0095.

TCCNS: PHYS 1304

PHYS 1401 General Physics I

4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

Introduction to Newtonian physics. Topics include Aristotelian physics and its overthrow, Newton's laws of motion and gravitation, and the motion of particles, rigid bodies and fluids. The idea of the universe as a law-governed system will be developed. Laboratory activities provide introduction to empirical methods in science. Fall, Spring, Summer.

Prerequisite: (MATH 1314, 1316*, 1324*, 1325*, 1442, 2312*, 2413*, 2414*, 2415*, minimum score of 21 in 'ACT1 Math', minimum score of 550 in 'SAT Math', minimum score of 21 in 'ACT Math' or minimum score of 550 in 'SAT1 Mathematics').

* May be taken concurrently.

Co-requisite: SMTE 0095.

TCCNS: PHYS 1401

PHYS 1402 General Physics II

4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)

Introduction to oscillatory and wave phenomena, electricity and magnetism. The classical theory of fields will be used to study electric and magnetic phenomena, including light, and their role in modern technology. Laboratory activities provide introduction to empirical methods in science. Fall, Spring, Summer.

Prerequisite: (PHYS 1401 or 2425).

Co-requisite: SMTE 0095.

TCCNS: PHYS 1402

PHYS 2425 University Physics I**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

A calculus based introduction to Newtonian physics. Topics include Aristotelian physics and its overthrow, Newton's laws of motion and gravitation, and the motion of particles, rigid bodies, and fluids. The idea of the universe as a law-governed system will be developed. Laboratory activities provide introduction to empirical methods in science. Fall, Spring, Summer.

Prerequisite: MATH 2413.

Co-requisite: SMTE 0095.

TCCNS: PHYS 2425

PHYS 2426 University Physics II**4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)**

Calculus based introduction to oscillatory and wave phenomena, electricity and magnetism. The classical theory of fields will be used to study electric and magnetic phenomena, including light, and their role in modern technology. Fall, Spring, Summer.

Prerequisite: PHYS 2425 and MATH 2414.

Co-requisite: SMTE 0095.

TCCNS: PHYS 2426

PHYS 3331 Mechanics I**3 Semester Credit Hours (3 Lecture Hours)**

Fundamentals of classical mechanics. Topics include particle dynamics in one, two and three dimensions: conservation laws; dynamics of a system of particles; motion of rigid bodies; central force problems; accelerating coordinate systems; Newton's theory of gravitation; Lagrange's and Hamilton's formulations of classical mechanics. This course is offered through the Texas Physics Consortium (TPC). See their website (<http://www.tarleton.edu/tpc/>) for details. Fall.

Prerequisite: PHYS 2426 and MATH 3315*.

* May be taken concurrently.

PHYS 3332 Electromagnetism**3 Semester Credit Hours (3 Lecture Hours)**

Electrostatics; Laplace's equation; the theory of dielectrics; magnetostatic fields; electromagnetic induction; magnetic fields of currents; Maxwell's equations. This course is offered through the Texas Physics Consortium (TPC). See their website (<http://www.tarleton.edu/tpc/>) for details. Fall.

Prerequisite: PHYS 2426 and (MATH 3315* or 2415*).

* May be taken concurrently.

PHYS 3333 Thermodynamics**3 Semester Credit Hours (3 Lecture Hours)**

Concept of temperature, equations of state; the first and the second law of thermodynamics; entropy; change of phase; the thermodynamics functions. This course is offered through the Texas Physics Consortium (TPC). See their website (<http://www.tarleton.edu/tpc/>) for details. Fall.

Prerequisite: PHYS 2426 and MATH 2415*.

* May be taken concurrently.

PHYS 3334 Modern Physics I**3 Semester Credit Hours (3 Lecture Hours)**

A course in special relativity and elementary quantum mechanics. Topics include relativistic description of space-time, relativistic energy and momentum, the uncertainty principle, Schrödinger's equation, observables and operators, bound states, potential barriers, and the quantum description of the hydrogen atom. This course is offered through the Texas Physics Consortium (TPC). See their website (<http://www.tarleton.edu/tpc/>) for details. Fall, Spring.

Prerequisite: PHYS 2426 and MATH 3315*.

* May be taken concurrently.

PHYS 3490 Selected Topics**1-4 Semester Credit Hours (1-4 Lecture Hours)**

Subject materials will be chosen from Electromagnetic Field Theory, Thermodynamics, Mathematical Methods of Physics, Waves and Optics, Advanced Modern Physics, Quantum Theory, Computational Physics, Geophysics, Environmental Physics and Medical Physics. May be repeated for credit if topics selected are different. This course will be used for upper-level physics electives offered from other Texas Physics Consortium (TPC) schools. See their website (<http://www.tarleton.edu/tpc/>) for details. Fall, Spring. Prerequisites vary.

PHYS 4085 Major Field Test in Physics**0 Semester Credit Hours**

The Major Field Test (MFT) in Physics is a national examination given to physics students in their last semester. It is a graduation requirement for all students in the Texas Physics Consortium students obtaining the Joint BS in Physics. Students enroll in this course during the semester that they plan to take the MFT and graduate. There is no cost to the student for either this course or for the MFT.

Prerequisite: PHYS 4162* and 4337*.

* May be taken concurrently.

PHYS 4161 Physics Research Project**1 Semester Credit Hour (1 Lecture Hour)**

The first half of a two semester sequence. The student will work with a faculty member to develop and conduct a senior research project including a search of the relevant literature and presentation of the proposed research idea. This course is offered through the Texas Physics Consortium (TPC). See their website (<https://web.tarleton.edu/tpc/>) for details. Fall.

Prerequisite: PHYS 3334.

PHYS 4162 Physics Research Seminar**1 Semester Credit Hour (1 Lecture Hour)**

The second half of a two semester sequence. The student will work with a faculty member to conduct a senior research project including giving an oral presentation of the final results and writing up the results in a form suitable for publication. This course is offered through the Texas Physics Consortium (TPC). See their website (<https://web.tarleton.edu/tpc/>) for details. Spring.

Prerequisite: PHYS 4161.

PHYS 4330 Mathematical Methods for Physicists**3 Semester Credit Hours (3 Lecture Hours)**

Mathematical techniques from the following areas: infinite series; integral transforming; applications of complex variables; vectors, matrices, and tensors; special functions; partial differential equations; Green's functions; perturbation theory; integral equations; calculus of variations; and groups and group representatives. This course offered through the Texas Physics Consortium (TPC). See their website (<https://web.tarleton.edu/tpc/>) for details. Spring.

Prerequisite: MATH 3315*.

* May be taken concurrently.

PHYS 4335 Quantum Physics**3 Semester Credit Hours (3 Lecture Hours)**

The Schroedinger equation; one dimensional systems; the Heisenberg uncertainty principle; magnetic moments and angular momentum; two and three dimensional systems; approximation methods; spin. This course is offered through the Texas Physics Consortium (TPC). See our website (<https://web.tarleton.edu/tpc/>) for details. Fall.

Prerequisite: PHYS 3334 and (MATH 3315* or 2415*).

* May be taken concurrently.

PHYS 4337 Nuclear Physics**3 Semester Credit Hours (3 Lecture Hours)**

The study of nuclear phenomena and properties including mass, stability, magnetic moment, radioactive decay processes and angular momentum. The use of nuclear techniques as applied to other scientific fields including electronics and medicine. This course is offered through the Texas Physics Consortium (TPC). See our website (<https://web.tarleton.edu/tpc/>) for details. Spring.

Prerequisite: PHYS 3334 and 4335* and (MATH 3315* or 2415*).

* May be taken concurrently.

PHYS 4340 Advanced Physics Lab**3 Semester Credit Hours (1 Lecture Hour, 4 Lab Hours)**

A laboratory course focusing on experimental design, advanced data analysis and reduction, and experimental laboratory techniques and instrumentation. Experiments will be drawn from a variety of physics areas. This course is offered through the Texas Physics Consortium (TPC). See our website (<https://web.tarleton.edu/tpc/>) for details. Spring.

Prerequisite: PHYS 3334*.

* May be taken concurrently.

Co-requisite: SMTE 0095.

PHYS 4496 Directed Independent Study**1-4 Semester Credit Hours (1-4 Lecture Hours)**

Requires a formal proposal of study to be completed in advance of registration and to be approved by the supervising faculty, the Chairperson, and the Dean of the College.