

PHYSICS

Greenquist 344 • 262-595-2326 • Keyword: *Physics*

Degree Offered:

Bachelor of Science.

Professors:

Mohazzabi, Ph.D.

Associate Professor:

Schmidt, Ph.D.

Distinguished Lecturer:

Bruning, Ph.D.

Lecturer:

Karanth, Ph.D.

Laboratory Manager:

Pidcock.

Student Organizations/Clubs:

Society of Physics Students

Department Overview

The Physics Department offers a rigorous and well-balanced program of courses leading to a bachelor of science degree in physics. The major is primarily intended for students who wish to pursue graduate work in physics or related areas, careers in higher education, or careers in technology-based industry.

The faculty is active in research. Current areas of research interest include astrophysics, computational physics, condensed matter theory, many-body theory, mathematical physics, quantum field theory, and statistical mechanics. Students majoring in physics have an excellent opportunity to get involved in ongoing research projects. In the recent past students have appeared as co-authors on a number of scientific publications in research and teaching journals.

The department is host to a chapter of the Society of Physics Students, a national organization run by the American Institute of Physics.

Requirements for the Physics Major (65 Credits)

The physics major consists of at least 42 credits of core and elective courses and a minimum of 23 credits of support courses, in addition to the general university requirements. At least 15 credits of upper level courses must be completed at UW-Parkside.

PHYS 201	General Physics I.....	5 cr
PHYS 202	General Physics II.....	5 cr
PHYS 205	Modern Physics	3 cr
PHYS 241	Scientific Programming.....	3 cr
PHYS 301	Classical Mechanics	4 cr
PHYS 302	Electricity and Magnetism.....	4 cr
PHYS 303	Computational Physics.....	3 cr
PHYS 306	Advanced Experiments in Physics	3 cr
PHYS 307	Mathematical Methods of Physics	3 cr
PHYS 403	Thermodynamics and Statistical Physics.....	4 cr
PHYS 441	Quantum Physics	4 cr
PHYS 495	Senior Seminar.....	1 cr

The following courses from related disciplines are required:

MATH 221	Calculus and Analytic Geometry I	5 cr
MATH 222	Calculus and Analytic Geometry II	5 cr
MATH 223	Calculus and Analytic Geometry III.....	5 cr
MATH 301	Linear Algebra	4 cr
MATH 317	Differential Equations/Applications.....	4 cr

Students planning graduate work in physics will generally take more than the minimum number of credit hours in physics and additional mathematics courses. Reading proficiency (equivalent to about two years of study at the college level) in one foreign language is also recommended for such students.

Requirements for the Physics Minor (32 credits)

PHYS 201	General Physics I*	5 cr
PHYS 202	General Physics II*.....	5 cr
PHYS 205	Modern Physics	3 cr
PHYS 306	Advanced Experiments in Physics	3 cr

Two additional physics courses are required. One (3 credit) at the 300 level or above and one (3 credit) at the 200 level or above.

The following mathematics courses are required:

MATH 221	Calculus and Analytic Geometry I	5 cr
MATH 222	Calculus and Analytic Geometry II	5 cr

* Qualified students may substitute PHYS 105-106 for the PHYS 201-202 requirement at the discretion of the Physics Department. Students are advised to consult the department for further information.

Courses in Physics (PHYS)

NOTE: In addition to the prerequisites listed below, a grade of C or better in PHYS 201 and 202 is required for entry to all 300- and 400-level physics courses.

- 101 Principles of Physics 4 cr**
Prereq: Computational Skills required or equivalent.
Freq: Fall, Spring.
 A one-semester introduction to fundamental principles of physics, their experimental basis, and applications. For students who need an introductory course in physics. Not open to students with credit in PHYS 105 or 201. Three-hour lecture; one-hour discussion.
- 102 Principles of Physics with Medical Applications..... 4 cr**
Prereq: Computational Skills required or equivalent.
Freq: Fall, Spring.
 A one-semester introduction to fundamental principles of physics, their experimental basis, and applications in nursing and related fields. For pre-health students who need an introductory course in physics. Not open to students with credit in PHYS 101, 105 or 201. Three-hour lecture; one-hour discussion.
- 105 College Physics I..... 5 cr**
Prereq: MATH 113, 114 or equivalent. Freq: Fall.
 Mechanics, heat, and sound. Not recommended for students majoring in physical science or engineering. Not open to students with credit in PHYS 201. Three-hour lecture; one-hour discussion; three-hour lab.
- 106 College Physics II..... 5 cr**
Prereq: PHYS 105. Freq: Spring.
 Electricity and magnetism, light and modern physics. Not open to students with credit in PHYS 202. Three-hour lecture; one-hour discussion; three-hour lab.
- 110 Introduction to Astronomy 3 cr**
Prereq: None. Freq: Fall, Spring.
 Astronomy for non-scientists. Largely non-mathematical. Planets, stellar evolution, galactic systems, cosmology. Three-hour lecture.
- 120 Astronomy in Non-Western Cultures 3 cr**
Prereq: None. Freq: Fall, Spring.
 Examines the astronomical views of Native Americans from a cultural perspective and looks at how worldview, science and discrimination intersect. Current cultural conflicts between Western astronomers and Native groups and the growth of modern astronomy from the astronomies of indigenous cultures will be examined. Crosslisted with ETHN 120. Three-hour lecture.
- 150 Physics of Music..... 3 cr**
Prereq: None. Freq: Fall.
 An introduction to the basic physical principles underlying music and musical instruments. Not for credit towards the physics major.
- 201 General Physics I 5 cr**
Prereq: MATH 221 (grade of C or higher) or concurrent registration (only with grade of B or higher in MATH 114 or equivalent). One year high school physics or PHYS 101 required. Freq: Fall.
 Mechanics, heat, and sound. For physical science and engineering majors. Three-hour lecture; one-hour discussion; three-hour lab.
- 202 General Physics II 5 cr**
Prereq: PHYS 201; MATH 222 or concurrent registration.
Freq: Spring.
 Electricity and magnetism, geometrical optics, and physical optics. For physical science and engineering majors. Three-hour lecture; one-hour discussion; three-hour lab.
- 205 Modern Physics 3 cr**
Prereq: PHYS 202. Freq: Fall.
 Special relativity. Elements of quantum mechanics. Introduction to atomic, molecular, solid state, nuclear, and particle physics. Three-hour lecture.
- 241 Scientific Programming..... 3 cr**
Prereq: PHYS 201 and MATH 221 or consent of instructor. Freq: Alternate Springs.
 Programming in C, C++, FORTRAN, PERL and symbolic or computer algebra languages with applications to scientific problem solving and simulations. Three-hour lecture/lab.
- 290 Special Topics in Physics 1-4 cr**
Prereq: Consent of instructor. Freq: Occasionally.
 Special topics in physics will be examined.
- 301 Classical Mechanics..... 4 cr**
Prereq: PHYS 201; MATH 317, or concurrent registration or consent of instructor. Freq: Alternate Falls.
 Vector analysis, conservation laws, planetary motion, rigid-body dynamics, free and forced oscillations, normal coordinates, moving coordinate systems, generalized coordinates, Lagrangian and Hamiltonian formulations. Continuum mechanics. Four-hour lecture.
- 302 Electricity and Magnetism..... 4 cr**
Prereq: PHYS 202; MATH 317, or concurrent registration or consent of instructor. Freq: Alternate Falls.
 Electrostatics, magnetostatics, electromagnetic fields through Maxwell's equations with basic applications. Radiation, Lienard-Wiechert potentials, sources of radiation, antenna theory. Scalar diffraction theory. Wave optics for transparent or conductive media. Four-hour lecture.
- 303 Computational Physics..... 3 cr**
Prereq: PHYS 205; MATH 223, PHYS 241, or consent of instructor. Freq: Alternate Springs.
 An introduction to computational physics with applications to classical mechanics, electromagnetism, and quantum mechanics. Monte Carlo methods. Introduction to molecular dynamics. Three-hour lecture.
- 306 Advanced Experiments in Physics 3 cr**
Prereq: PHYS 205. Freq: Alternate Springs.
 Advanced experiments in optics, atomic, molecular, solid state, and nuclear physics. Analog electronics through transistors and op-amps. Basic digital electronics. Six-hour lab.
- 307 Mathematical Methods of Physics..... 3 cr**
Prereq: MATH 222, PHYS 202. Freq: Alternate Falls.
 Methods of integration, series and products, combinatorics, statistics, special functions and differential equations, numerical methods and algorithms. Three-hour lecture.
- 403 Thermodynamics and Statistical Physics..... 4 cr**
Prereq: MATH 301 and 317 or PHYS 307 or consent of instructor.
Freq: Alternate Springs.
 An introduction to equilibrium statistical mechanics and its applications. The first half emphasis is on thermodynamics and classical statistical mechanics, microcanonical, canonical, and grand canonical ensembles, partition functions, and the Ising model. The second half is quantum statistical mechanics, Fermi and Bose gases, and critical phenomena. Four-hour lecture.
- 441 Quantum Physics 4 cr**
Prereq: PHYS 205; MATH 301 and 317 or PHYS 307 or consent of instructor. Freq: Alternate Springs.
 The origin of quantum mechanics. The free particle in wave mechanics. Particles in one-dimensional potentials. Axiomatic foundations of quantum mechanics; the evolution of states in time. Particles in three dimensions and angular momentum. Central potentials. The course also introduces the concept of spin and the exclusion principle, and the Dirac equation with its associated phenomenology. Four-hour lecture.
- 490 Special Topics in Physics 1-4 cr**
Prereq: Consent of instructor. Freq: Occasionally.
 Special topics in physics will be examined.

495 Senior Seminar 1 cr

Prereq: Junior or senior standing. Freq: Fall, Spring.

A directed study of one of the current topics in physics. Each student is required to submit a written report and present a 50-minute seminar on the subject. Students are recommended to take two consecutive semesters of 495.

497 Senior Thesis.....1-2 cr

Prereq: Consent of instructor. Freq: Occasionally.

By special arrangement with instructor.

499 Independent Study.....1-3 cr

Prereq: Consent of instructor and department chair.

Freq: Occasionally.

By special arrangement with instructor.