Physics

The Wiess School of Natural Sciences

Chair
F. Barry Dunning

Professors
Stephen D. Baker
Billy E. Bonner
Marjorie D. Corcoran
Ian M. Duck
Thomas L. Estle, Emeritus
James P. Hannon
Huey W. Huang
Randall G. Hulet
F. Curtis Michel
Hannu E. Miettinen
Gordon S. Mutchler
Peter Nordlander
Carl Rau
Jabus B. Roberts, Jr.
Richard E. Smalley
Paul M. Stevenson
George T. Trammell, Emeritus
G. King Walters
Associate Professor
Stanley A. Dodds
Assistant Professors
Alexander J. Rimberg
Qimiao Si
Distinguished Faculty Fellows
Edward B. Platner
Ken A. Smith
Senior Faculty Fellow
David L. Adams
Faculty Fellows
William J. Llope
B. Paul Padley
Pablo P. Yepes

Degrees Offered: B.A., M.A., Ph.D.

In addition to the regular undergraduate physics major, the Physics Department offers options in space physics and astronomy, applied physics (which facilitates a double major in electrical engineering), and biophysics, as well as an interdepartmental major in chemical physics. Within the graduate program, research facilities and thesis supervision are available in atomic and molecular physics, biophysics, nuclear and particle physics, condensed matter and surface physics, and theoretical physics.

Degree Requirements for B.A. in Physics

For general university requirements, see Graduation Requirements (pages 17–19). Students majoring in physics may select the regular physics major or one of several options within the department, as well as an interdepartmental major in chemical physics. Students may obtain credit for some courses by advanced placement, and the department’s Undergraduate Committee can modify requirements to meet the needs of students with special backgrounds. The physics requirements for double majors are the same as those for single majors, except that substitutions may be possible when students have taken comparable courses in other departments.
All physics majors must complete the following courses:

PHYS 101 or 111 Mechanics
PHYS 102 or 112 Electricity and Magnetism
PHYS 201 Waves and Optics
PHYS 202 Modern Physics
PHYS 231 Elementary Physics Lab II
PHYS 301 Intermediate Mechanics
PHYS 302 Intermediate Electrodynamics
PHYS 311 Introduction to Quantum Physics I

MATH 101 and 102 Single Variable Calculus I and II
MATH 211 Ordinary Differential Equations and Linear Algebra
MATH 212 Multivariable Calculus
(MATH 221 and 222 Honors Calculus III and IV may substitute for MATH 211 and 212)
CHEM 121 General Chemistry or CHEM 151 Honors Chemistry

Additional courses are required.

For the regular physics major:

PHYS 312 Introduction to Quantum Physics II
PHYS 331 and 332 Junior Physics Lab I and II
PHYS 411 Introduction to Nuclear and Particle Physics (or approved substitute)
PHYS 412 Solid-State Physics (or approved substitute)
PHYS 425 Statistical and Thermal Physics
PHYS 431 and 432 Senior Physics Research I and II
MATH 381 Introduction to Partial Differential Equations and MATH 382 Complex Analysis or CAAM 335 and 336 Foundations of Applied Mathematics I and II
CHEM 122 General Chemistry or CHEM 152 Honors Chemistry

For the physics major with option in space physics and astronomy:

PHYS 425 Statistical and Thermal Physics
SPAC 100 Seminar: Exploring the Cosmos
SPAC 230 Astronomy Laboratory
SPAC 350 Introduction to Astrophysics
SPAC 360 Galaxies and Cosmology
SPAC 400 Undergraduate Research Seminar
Two semesters of SPAC 490 Undergraduate Research
One topical group chosen from: SPAC 443 Atmospheric Science, SPAC 470 Solar System Physics, and SPAC 480 Introduction to Plasma Physics; or SPAC430 Teaching Astronomy, SPAC 450 Experimental Space Science, and ELEC 361 Electronic Materials and Quantum Devices; or SPAC 451 Astrophysics I: Sun and Stars, SPAC 480 Introduction to Plasma Physics, and PHYS 312 Introduction to Quantum Physics II.

CAAM 211 Introduction to Engineering Computation or NSCI 230 Computation in the Natural Sciences
CAAM 336 Foundations of Applied Mathematics II

For the physics major with option in applied physics:

ELEC 306 Electromagnetic Fields and Devices may substitute for PHYS 302
PHYS 312 Introduction to Quantum Physics II or ELEC 361 Electronic Materials and Quantum Devices
Two of PHYS 331 or 332 Junior Physics Lab I or II or ELEC 327 Digital Logic Design Laboratory or ELEC342 Electronic Circuits or ELEC 465 Physical Electronics Practicum
PHYS 412 Solid-State Physics, or approved substitute in applied physics
PHYS 425 Statistical and Thermal Physics
PHYS 431 and 432 Senior Physics Research I and II
ELEC 243 Introduction to Electronics or ELEC 242 Fundamentals of Electrical Engineering II
ELEC 305 Introduction to Physical Electronics
MATH 381 Introduction to Partial Differential Equations or CAAM 335 Foundations of Applied Mathematics I
CHEM 122 General Chemistry or CHEM 152 Honors Chemistry
For the physics major with option in biophysics:

PHYS 312 Introduction to Quantum Physics II
PHYS 425 Statistical and Thermal Physics
BIOS 201 and 202 Introductory Biology I and II
BIOS 301 Biochemistry
CHEM 122 General Chemistry or CHEM 152 Honors Chemistry
CHEM 211 and 212 Organic Chemistry I and II
CHEM 213 and 214 Organic Chemistry Lab I and II

Chemical Physics Major
All chemical physics majors must complete the following courses:
PHYS 101 or 111 Mechanics
PHYS 102 or 112 Electricity and Magnetism
PHYS 201 Waves and Optics
PHYS 202 Modern Physics
PHYS 231 Elementary Physics Lab II
PHYS 301 Intermediate Mechanics
PHYS 302 Intermediate Electrodynamics
Two of PHYS 311 or 312 Introduction to Quantum Physics I or II or CHEM 415 Chemical Kinetics and Dynamics or CHEM 430 Quantum Chemistry
MATH 101 and 102 Single Variable Calculus I and II
MATH 211 Ordinary Differential Equations and Linear Algebra
MATH 212 Multivariable Calculus
(MATH 221 and 222 Honors Calculus III and IV may substitute for MATH 211 and 212)
Six hours from NSCI 230 Computation in the Natural Sciences or CAAM 210 or 211 Introduction to Engineering Computation or advanced (300 level or above) CAAM or MATH courses.
CHEM 121 and 122 General Chemistry or CHEM 151 and 152 Honors Chemistry
CHEM 211 Organic Chemistry I
CHEM 212 Organic Chemistry I or CHEM 360 Inorganic Chemistry
CHEM 311 and 312 Physical Chemistry I and II
Six hours from CHEM 213 or 214 Organic Chemistry Laboratory or CHEM 351 or 352 Introductory Module in Experimental Chemistry or CHEM 371–377 Advanced Modules or PHYS 331 or 332 Junior Physics Lab I or II

Degree Requirements for M.A. and Ph.D. in Physics

For general university requirements, see Graduate Degrees (pages 72-73). Detailed information on research programs in physics and specific departmental degree requirements are available from the Department of Physics.

M.A. Program. The M.A. degree requires at least one year of graduate study. Students must complete 30 semester hours of approved graduate-level studies, including a research thesis performed under the direction of a physics faculty member.

Ph.D. Program. To be eligible for the Ph.D. degree, graduate students must demonstrate to the department their ability to engage in advanced research; this is normally accomplished by successfully completing the work for the M.A. in physics. Students must also complete 60 semester hours of approved graduate-level study at Rice and produce a research thesis under the direction of a physics faculty member. At least two years of graduate study are required for the Ph.D.

See PHYS (pages 461-463) in the Courses of Instruction section.