



Department of Physics and Astronomy

Career Alternatives

Among the more than 340 physics graduates of SSU are physicists, astronomers, geophysicists, professors, pilots, teachers, and a great many engineers and computer professionals. Graduates have earned M.S. and Ph.D. degrees in physics, applied physics, astronomy, geophysics, physical chemistry, biophysics, bioengineering, atmospheric science, materials science, mathematics, and computer science, as well as advanced degrees in law, medicine, and chiropractic. Others have pursued graduate studies in business, history and philosophy of science, political science, and several branches of engineering. Still other graduates have started small businesses in solar energy, robotics, solar construction, computers and electronics.

Graduates work in electronics, telecommunications, aerospace, and optics; they teach in high schools and colleges; they are found in national laboratories designing the next generation of particle accelerators, operating giant telescopes, or gathering and analyzing satellite data. More than two-thirds of the graduates have kept in touch with the department. They report that their employers are quite pleased with the depth and breadth of their training. As the nation moves to meet the technological challenges of our time, the demand for well-educated men and women with an undergraduate education in physics continues to grow.

B.A. Degree in Physics

B.S. Degree in Physics

B.S. Degree in Physics with concentration in Applied Physics

Minors in Physics and in Astronomy

For many years Sonoma State University has been the leader in the California State University system in the percentage of undergraduates majoring in physics. The department emphasizes individualized undergraduate instruction based on hands-on experience with modern equipment, and many students pursue individual research projects. Physics students learn nature's laws and how to apply them to problems in optics, electronics, solids, materials, biophysics, energy, and the universe. They become proficient in electronics and computing as they learn to plan research programs, gather data, and analyze that data with computer and brain.

SSU physics students have won Goldwater scholarships, a National Science Foundation Fellowship, a National Center for Atmospheric Research fellowship, and assistantships and fellowships from many graduate schools, including Caltech, UC Berkeley, Harvard, Stanford, and MIT. They have been selected for summer research programs at the Maria Mitchell Observatory, Stanford Linear Accelerator Center, Lawrence Berkeley Laboratory, and the Argonne, Oak Ridge, and Brookhaven National Laboratories, as well as many research universities. They have presented papers at meetings of physics and astronomy societies and co-authored papers for scholarly journals. A combination public lecture series and undergraduate colloquium called "What Physicists Do" has brought outstanding scientists and engineers—among them twelve Nobel laureates—to the campus each week since 1971. Much more information about the department, including information from 40% of its graduates, may be found at <http://phys-astro.sonoma.edu/>.

Programs

The department offers a Bachelor of Science (B.S.) in physics, a B.S. in physics with a concentration in applied physics, a Bachelor of Arts (B.A.) in physics, and minors in both physics and astronomy.

The B.S. is rigorous. The emphasis is on a thorough knowledge of both theoretical and experimental physics. Electives may be chosen from such courses as semiconductor device physics, advanced analog and digital electronics, advanced observational astronomy, applied nuclear physics and chemistry, x-ray analysis, photonics with laboratory courses in lasers and holography and in fiber optics and detectors, image processing in astronomy, and astrophysics. Graduates have been found to be unusually well prepared for graduate study or for demanding professional positions in science and engineering.

The B.A. is flexible. The more popular advisory plan uses calculus and includes the same introductory courses as the B.S. An alternative plan begins with algebra and trigonometry and the introductory physics sequence usually taken by students preparing for the health professions or other related fields. Upper division courses for the B.A. are chosen by the student and advisor in accordance with the student's individual goals. These goals may include engineering, teaching, science journalism, sales, management, medicine, or law. The B.A. also requires a twelve unit concentration in a field outside of physics.

The B.S. in Physics

	Units	Total
Physics:		
Introductory with lab.....	14	
Intermediate and advanced (mechanics; electromagnetism; optics; electronics; scientific computing; mathematical, experimental, statistical and quantum physics)	26	
Advanced electives chosen from photonics, semiconductor devices; x-ray; nuclear; observational astronomy; astrophysics; nuclear, etc. (Must include a capstone course)	6	46
Mathematics:		
Calculus, including differential equations.....	16	16
Chemistry:		
General.....	10	10
General Education:		
(51 units required. May include 9 above)	42-51	
Electives	1-10	
TOTAL		124

**The B.S. in Physics with Concentration
in Applied Physics**

	Units	Total
Physics:		
Introductory with lab	14	
Intermediate and advanced (electronics; electromagnetism; optics; scientific computing; mathematical, experimental, statistical and quantum physics; semiconductor devices).....	26	
Senior design project	2	
Advanced electives chosen from mechanics; electronics; x-ray analysis; photonics; nuclear chemistry and physics, lasers, mathematical physics; Must include a capstone course	8	48
Mathematics:		
Calculus.....	12	12
Chemistry:		
General.....	5	5
General Education:		
(51 units required. May include 9 above.)	42-51	
Electives	8-17	
TOTAL		124

**The B.A. in Physics with Advisory Plan T
(Algebra & Trig)**

	Units	Total
Physics:		
Introductory physics	8	
Upper division physics and astronomy, including capstone course.....	24	
Mathematics:		
Pre-calculus	4	
Area of concentration (one other subject)....	12	48
General education:		
(51 units required. Includes 7-9 above.).....	42-44	
Electives:		
(May include double major).....	28-30	
TOTAL		120

**The B.A. in Physics with Advisory Plan C
(Calculus)**

	Units	Total
Physics:		
Introductory physics with lab.....	14	
Additional upper division physics and astronomy, including optics, Scientific computing, capstone course	20	
Mathematics:		
Calculus	12	
Area of concentration (one other subject)....	12	58
General Education:		
(51 units required. Includes 7-9 above.).....	42-43	
Electives:		
(May include double major.).....	19-20	
TOTAL		120

Facilities

All of the department's resources are devoted to undergraduate education. Students have access to even the most advanced equipment for classroom, laboratory and research projects. The department possesses equipment in the areas of lasers, optics, photonics, electronics, X-ray characterization, nuclear physics, semiconductor physics, astronomy, and materials growth and characterization.

This equipment includes an argon ion laser, a tunable dye laser, diode lasers and a variety of optical fibers, optical fiber sensors, interferometers and spectrum analyzers. There are facilities for energy dispersive X-ray fluorescence and crystal diffraction studies; gamma ray spectroscopy and neutron activation, and a Hall system for semiconductor studies.

On and off-campus observatories include computer-controlled telescopes and charge-coupled device (CCD) imaging systems. In the area of materials there are deposition chambers, a high vacuum test chamber, Auger electron spectroscopy for thin film analysis, a new scanning electron microscope with energy dispersive X-ray analysis, and atomic force microscopes. More information about the department may be found at <http://phys-astro.sonoma.edu/>.

An Invitation

To arrange a visit, ask questions, or receive announcements of the "What Physicist Do" public lectures and public viewing nights at the SSU Observatory, call the department, or contact the department advisor, Dr. Bryant Hichwa, at bryant.hichwa@sonoma.edu or (707) 664-2119