PHYSICS (PHY)

PHY 1101 General Physics (5 Credits)
The first quarter of a general introduction to physics, intended for biology and premed majors. Covers mechanics. Typically offered: Autumn.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201101)

PHY 1102 General Physics (5 Credits)
The second quarter of a general introduction to physics, intended for biology and premed majors. Covers heat, sound, fluids, waves, and optics. Typically offered: Winter.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201102)

PHY 1103 General Physics (5 Credits)
The third quarter of a general introduction to physics, intended for biology and premed majors. Covers electricity, magnetism, circuits, and modern physics. Typically offered: Spring.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201103)

PHY 1110 Introduction to the Nature of Science (5 Credits)
Provides a lecture, demonstration and discussion course in the physical sciences. Examines the scientific method in light of what it does and does not do. Covers selected scientific concepts and theories, drawing most of the examples from the field of physics.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201110)

PHY 1121 Physics for Science and Engineering (5 Credits)
In this course, students will explore foundational ideas of motion, force, and energy through a discussion-based, exploratory approach. Emphasis will be placed on the development of the student's identity as a scientist and on building representations to model physical phenomena. All class sessions will involve active participation of the student in the process of constructing and refining scientific ideas through discussion and experimentation.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201121)

PHY 1122 Physics for Science and Engineering (5 Credits)
In this course, students will explore foundational ideas of rotation, heat and fluids through a discussion-based, exploratory approach. Emphasis will be placed on the development of the student's identity as a scientist and on building representations to model physical phenomena. All class sessions will involve active participation of the student in the process of constructing and refining scientific ideas through discussion and experimentation.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201122)

PHY 1123 Physics for Science and Engineering (5 Credits)
In this course, students will explore foundational ideas of waves, optics and electricity through a discussion-based, exploratory approach. Emphasis will be placed on the development of the student's identity as a scientist and on building representations to model physical phenomena. All class sessions will involve active participation of the student in the process of constructing and refining scientific ideas through discussion and experimentation.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201123)

PHY 1135 Astronomy: Individual and the Universe (5 Credits)
An integrative general introduction to astronomy, including astronomical observation and measurement, the solar system, extragalactic phenomena and cosmology. Includes the scientific method and worldview implications.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201135)

PHY 1140 The Physics of Sound (5 Credits)
Fundamentals of simple harmonic motion, nature of sound, transmission and reception of sound, pitch, quality, loudness, musical intervals, diatonic equal tempered scales, musical instruments, acoustics of instruments, acoustics of buildings, modern research in sound and acoustics.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201140)

PHY 1142 Earth System Science (5 Credits)
An interdisciplinary introduction to the processes, interactions and development of the earth's biosphere, geosphere and hydrosphere. Special emphasis will be given to current environmental issues and environmental stewardship.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201142)

PHY 1910 Special Topics in Physics Seminar (1 Credit)
Provides a direct study of current problems and research areas in physics such as astrophysics, chaos and complexity, particles and fields, and relativity.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%201910)

PHY 2321 Intermediate Physics (5 Credits)
Introduction to the physics of the 20th century: relativity, waves and quanta with applications to areas of contemporary physics such as atoms, nuclei, particles and solids.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%202321)

PHY 2573 Concepts in Physical Science for Educators (5 Credits)
This course is a laboratory-based study of selected topics in physical science, including energy transfer and transformation, forces, daily and annual motion of the sun and moon, and physical changes. Emphasis is on depth of understanding, scientific reasoning skills, and the development of pedagogical content knowledge. This course is designed to engage students in the practices of scientists and engineers and models reformed teaching practices that are guided by results from research in science education, cognitive science, and the professional development of teachers. This course is a preparation for teaching K-8 physical science based on the next Generation Science Standards. Typically offered: Winter.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%202573)

PHY 2950 Special Topics in Physics (1-5 Credit)
A course studying a special interest topic in physics and physical science. Topics and credits may vary between offerings.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%202950)

PHY 3011 Global Climate Change: Scientific, Social and Moral Implications (5 Credits)
Understanding human influences on the Earth's climate is one of the most exciting scientific challenges of our time. We have learned a tremendous amount about our planet but the complexity of climate prevents us from making precise predictions. The majority of climate scientists agree that dramatic action may be needed very soon, yet effective responses could radically alter our lifestyles and economic systems. In this course we will engage with the complexity of climate science and energy policy. We will work together to construct strategies for reducing greenhouse gas emissions and we will critically consider the implications of these strategies. This course will be project based with a strong emphasis on specific, tangible actions to address the challenge of climate change in a manner that is sustainable and equitable.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203011)

PHY 3110 Mechanical Modeling and Analysis (3 Credits)
This course will introduce students to tools, techniques and strategies for analyzing complex mechanical phenomena. Students will use sensors and video to collect force and motion data from real systems. Theory, mathematical and computational methods will be used to develop semi-empirical models for physical systems. Topics covered may include: velocity dependent forces, oscillations, vector force fields, orbital mechanics, non-inertial reference frames, and Lagrangian mechanics.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203110)

PHY 3211 Acoustics (5 Credits)
EGR 3500 is a preferred prerequisite. A first course for engineering and physics students in the field of Acoustics and Noise Control Engineering. This course will cultivate a foundational understanding of fundamental acoustical principles such as simple harmonic oscillators, lumped element analysis, sound fields in bounded and unbounded spaces, human response to noise, and environmental and safety issues. Applications will include Helmholtz resonators, loudspeaker enclosures, room acoustics, environmental noise, and HVAC noise and vibration control.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203211)

PHY 3310 Electricity and Magnetism I (5 Credits)
The first of a two-course sequence, this course studies vector calculus, electrostatics, magnetostatics, boundary conditions, electromagnetic waves, and introduction to applications. Typically offered: Autumn.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203310)

PHY 3311 Experimental Methods I (3 Credits)
In this course students will be introduced to advanced methods, tools and cognitive tasks required for contemporary scientific investigation and experimental research. Students will participate collaboratively in the design and implementation of benchtop research projects in physics and related fields. Students will use computers for collecting, analyzing and modeling experimental data. Special emphasis will be given to strategies for constructing and testing quantitative models for physical phenomena.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203311)

PHY 3312 Experimental Methods II (3 Credits)
In this course students will build on knowledge and skills developed in Research Methods I in order to gain greater ownership of the strategies required for autonomous experimental research. Students will participate collaboratively in the process of forming their own research questions and constructing a plan for investigating these questions. Students will use computers for collecting, analyzing and modeling experimental data.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203312)

PHY 3313 Experimental Methods III (3 Credits)
In this course students will build on knowledge and skills developed in Research Methods I & II in order to take full ownership of an autonomous laboratory investigation. Students will participate collaboratively in the processes of: forming a focused research question, writing and refining a research proposal, constructing, testing, calibrating and modifying experimental apparatus, developing and executing data collection and analysis protocols, and synthesizing and presenting research findings.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203313)

PHY 3315 Electricity and Magnetism I (3 Credits)
The first of a two-course sequence, this course studies electrostatics, magnetostatics, boundary conditions, electromagnetic waves, and introduction to applications. Typically offered: Autumn.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203315)

PHY 3341 Quantum Mechanics (5 Credits)
This course studies quantum mechanics with wave, operator and matrix computational techniques. It investigates solutions to familiar quantum mechanical systems and introduces applications to quantum computing. Typically offered: Winter.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203341)

PHY 3401 Thermal and Statistical Physics (3 Credits)
This is the second course of a two course sequence and studies heat, thermodynamics, elementary kinetic theory, and statistical physics. Typically offered: Winter.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%203401)

PHY 4101 Astrophysics of Stars (5 Credits)
Introduction to stars (physical and observational), hydrodynamics of self-gravitating fluids, statistical mechanics and equations of state, energy transport, astrophysical nuclear reactions, stellar models, advanced topics. Typically offered: Varies.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204101)

PHY 4311 Optics and Lasers (5 Credits)
General theory of geometrical optics, physical optics, fiber optics and optical devices. Lectures and laboratory each week. Typically offered: Alternate Years.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204311)

PHY 4315 Electricity and Magnetism II (3 Credits)
The second of a two-course sequence, this course continues the study of electrostatics, magnetostatics, boundary conditions, electromagnetic waves, and is an introduction to applications such as skin effect, reflections, waveguides, antennas and optics. Includes computer and laboratory experiments. Typically offered: Spring.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204315)

PHY 4340 Quantum Mechanics II (3 Credits)
The second of a two-course sequence, this course is a continuation of the study of basic wave mechanics, quantum mechanical operators, dynamics of the wave functions, traveling waves, and bound states. Typically offered: Spring.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204340)

PHY 4520 Preparing to Teach (2 Credits)
Preparation for teaching across the curriculum using instructional materials that have been guided by results from education research. Includes supervised teaching practicum.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204520)

PHY 4898 Physics Capstone (1 Credit)
A capstone experience for seniors that explores current physics topics. Seminars addressing current research advances, ethical issues in science or the intersection of science, vocation and Christian faith are presented. Discussion and reflection incorporate appropriate readings. This capstone will prepare students for a separate research project that must be completed during the senior year to fulfill the senior capstone requirement. Typically offered: Winter.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204898)

PHY 4900 Independent Study (1-5 Credit)
Student works independently with a faculty member on a mutually agreed upon topic.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204900)

PHY 4940 Internship in Physics (1-5 Credit)
Provides a significant learning experience to be obtained in a closely supervised work-study program.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204940)

PHY 4950 Special Topics in Physics (1-5 Credit)
An advanced course studying a special interest topic in physics and physical science. Topics and credits may vary between offerings.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204950)

PHY 4970 Undergraduate Research (1-5 Credit)
Independent research directed toward satisfaction of requirement of senior project for graduation with major in physics.
Course Schedule (https://catalog.spu.edu/course-search/?details&code=PHY%204970)