PHYS 3210 Experimental Physics II Laboratory 0 (4) Non-credit laboratory to accompany PHYS 3260. Coreq: PHYS 3260.

PHYS 3550 Modern Physics 3 (3) Study of the topics of modern physics, including relativity, atomic physics, quantum mechanics, condensed-matter physics, nuclear physics, and elementary particles. Includes Honors sections. Preq: PHYS 2220 and MATH 2060.


PHYS 3990 Creative Inquiry—Physics and Astronomy 1-4 (1-4) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

PHYS 4010 Senior Thesis 1-3 (1-3) Semi-original theoretical, experimental, or computational research project performed under the direction of a faculty member. Fields available include astronomy, astrophysics, atmospheric physics, biophysics, high energy physics, relativity, solid state physics, and statistical mechanics. May be repeated for a maximum of six credits. Includes Honors sections. Preq: Nine credits of physics at the 3000- or 4000-level.

PHYS 4170 Introduction to Biophysics I 3 (3) Introduction to the application of physics to biological problems. Topics include review of elementary chemical and biological principles, physics of biological molecules, and fundamentals of radiation biophysics. Includes Honors sections. Preq: MATH 2060 and PHYS 2210.

PHYS 4200 Atmospheric Physics 3 (3) Study of physical processes governing atmospheric phenomena. Topics include thermodynamics of dry and moist air, solar and terrestrial radiative processes, convection and cloud physics, precipitation processes, hydrodynamic equations of motion and large-scale motion of the atmosphere, numerical weather prediction, atmospheric electricity. Preq: MATH 1080; and PHYS 2080 or PHYS 2210.

PHYS 4210 Optics 3 (3) Covers a selection of topics, depending on the interest of the student. Topics may include the formation of images by lenses and mirrors, design of optical instruments, electromagnetic wave propagation, interference, diffraction, optical activity, lasers, and holography. Includes Honors sections. Preq: PHYS 2210.

PHYS 4410 Electromagnetics I 3 (3) Study of the foundations of electromagnetic theory. Topics include electric fields, electric potential, dielectrics, electric circuits, solution of electrostatic boundary-value problems, magnetic fields, and magnetostatics. Includes Honors sections. Preq: PHYS 2210 and MATH 2080.

PHYS 4420 Electromagnetics II 3 (3) Continuation of PHYS 4410. Study of foundations of electromagnetic theory. Topics include magnetic properties of matter, microscopic theory of magnetization, electromagnetic induction, magnetic energy, AC circuits, Maxwell's equations, and propagation of electromagnetic waves. Other topics may include waves in bounded media, antennas, electrodynamics, special theory of relativity, and plasma physics. Includes Honors sections. Preq: PHYS 4410.

PHYS 4450 Solid State Physics I 3 (3) Topics include an overview of crystal structures, chemical and atomic bonding, and periodicity in relation to solid materials. Covers electronic, thermal, and magnetic properties of materials, electrical conduction in metals and semiconductors. Overview of the role of electrons and phonons and their interactions is presented. Preq: PHYS 2210.

PHYS 4460 Solid State Physics II 3 (3) Continuation of PHYS 4450, including selected topics in solid-state physics such as optical properties, superconductivity, non-crystalline solids, dielectrics, ferroelectrics, and nanomaterials. Plasmons, polarons, and excitons are discussed. Brief introduction into methods of solid-state synthesis and characterization tools is presented. Includes Honors sections. Preq: PHYS 4450.

PHYS 4520 Nuclear and Particle Physics 3 (3) Study of our present knowledge concerning subatomic matter. Experimental results are stressed. Topics include particle spectra, detection techniques, Regge pole analysis, quark models, proton structure, nuclear structure, scattering and reactions. Includes Honors sections.

PHYS 4550 Quantum Physics I 3 (3) Discussion of solution of the Schrodinger equation for free particles, the hydrogen atom, and the harmonic oscillator. Includes Honors sections. Preq: PHYS 3220.

PHYS 4560 Quantum Physics II 3 (3) Continuation of PHYS 4550. Application of principles of quantum mechanics as developed in PHYS 4550 to atomic, molecular, solid state, and nuclear systems. Includes Honors sections. Preq: PHYS 4550.

PHYS 4650 Thermodynamics and Statistical Mechanics 3 (3) Study of temperature development of the laws of thermodynamics and their application to thermodynamic systems. Introduction to low temperature physics is given. Includes Honors sections. Preq: PHYS 3210.

PHYS 4750 Selected Topics 1-3 (1-3) Comprehensive study of a topic of current interest in the field of physics. May be repeated for a maximum of six credits, but only if different topics are covered. Preq: Consent of instructor.

PHYS 4810 Physics of Surfaces 3 (3) Introduction for advanced undergraduates to the physics and chemical physics of solid surfaces and to the interaction of atoms and molecules with those surfaces. Preq: PHYS 3120 and PHYS 3220 and PHYS 3250 and PHYS 3260 and PHYS 4410.

PHYS 4810 Non-linear systems such as optical properties, superconductivity, non-crystalline solids, dielectrics, ferroelectrics, and nanomaterials. Plasmons, polarons, and excitons are discussed. Brief introduction into methods of solid-state synthesis and characterization tools is presented. Includes Honors sections. Preq: PHYS 4450.

PHYS 4820 Solid State Physics II 3 (3) Continuation of PHYS 4450, including selected topics in solid-state physics such as optical properties, superconductivity, non-crystalline solids, dielectrics, ferroelectrics, and nanomaterials. Plasmons, polarons, and excitons are discussed. Brief introduction into methods of solid-state synthesis and characterization tools is presented. Includes Honors sections. Preq: PHYS 4450.

PHYS 4820 Surface Experiments Laboratory 0 (3) Non-credit laboratory to accompany PHYS 4820. Coreq: PHYS 4820.

PHYS 4990 Creative Inquiry—Physics and Astronomy 1-4 (1-4) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. Preq: Consent of faculty member/mentor.

PACKAGING SCIENCE


PKSC 1010 Packaging Orientation 1 (1) Overview of the various principles and practices in packaging science, historical development, packaging as a career.

PKSC 1020 Introduction to Packaging Science 2 (2) Considers functions of a package; materials, processes, and technology used in package development; and the relationship of packaging to the corporation, consumer, and society as a whole.

PKSC 1030 Packaging Science E-Portfolio 1 (1) Packaging Science majors initiate professional electronic portfolios that showcase their skills and experiences and lead to career e-portfolios. Students demonstrate proficiency in using important software tools; are introduced to Packaging Science faculty, emphasis areas, and targeted library services; and discuss academic integrity. Preq: PKSC 1010. Preq or concurrent enrollment: PKSC 1020.

PKSC 2010 Packaging Perishable Products 3 (3) Covers fundamental characteristics and applications of various materials and systems used to package perishable products such as foods and pharmaceuticals. Discusses packaging issues regarding food, pharmaceutical, and medical packaging. Includes product/package interactions and packaging requirements to address basic theory in food and pharmaceutical protection. Preq or concurrent enrollment: CH 2010 and PKSC 2020 and PKSC 2021.


PKSC 2030 Packaging Research Fundamentals 2 (2) Principles, methods, and resources for organizing, researching, and reporting technical work in packaging science. Preq: PKSC 1020 and PKSC 1030 and ENGL 1030 and Packaging Science major.
PKSC 2040 Container Systems (Rigid and Flexible) 3 (3) Examination of all the packages and containers used to develop systems to distribute products. Compatibility of product and package, structural design, costs, and merchandising considerations are stressed. Preq: PKSC 2020. Coreq: PKSC 2060.

PKSC 2060 Container Systems Laboratory 1 (3) Laboratory practice in sample making, designing and constructing various containers. Coreq: PKSC 2040.

PKSC 2200 Product/Package Design and Prototyping 4 (2) Overview of structural and graphic development tools for product and packaging design. Focus on digital creation, photo rendering, wide-format plotting/proofing, rapid prototyping, visualization and real-time 2d/3d design. Course utilizes online lectures and hands-on laboratory experience at The Sonoco Institute. Coreq: PKSC 2201.

PKSC 2201 Product/Package Design and Prototyping Laboratory 0 (6) Non-credit laboratory to accompany PKSC 2200. Coreq: PKSC 2200.

PKSC 2990 Creative Inquiry—Packaging Science 1-4 (1-4) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. To be taken Pass/No Pass only. Preq: Consent of faculty member/mentor.

PKSC 3200 Packaging Design Theory 3 (2) Study of human factors psychology as it relates to product and package development. Lecture topics center on advanced color theory, space, shape, texture, pattern, typography, branding, marketing, consumer studies, ergonomics, sustainability and applied packaging. Laboratory focuses on developing retail packaging through applying course theory, group development and peer critique. Preq: PKSC 2200. Coreq: PKSC 3201.

PKSC 3201 Packaging Design Theory Laboratory 0 (3) Non-credit laboratory to accompany PKSC 3200. Coreq: PKSC 3200.

PKSC 3680 Packaging and Society 3 (3) Study of the role of packaging in society as it specifically relates to the responsibilities of the packaging scientist in protecting people and the environment. Includes study of packaging and environmental regulations and guidelines currently in place to achieve these goals. Ability to make informed decisions and ethical judgments is an encompassing goal. Includes Honors sections.

PKSC 3990 Creative Inquiry—Packaging Science 1-4 (1-4) In consultation with and under the direction of a faculty member, students pursue scholarly activities individually or in teams. These creative inquiry projects may be interdisciplinary. Arrangements with mentors must be established prior to registration. May be repeated for a maximum of eight credits. To be taken Pass/No Pass only. Preq: Consent of faculty member/mentor.

PKSC 4010* Packaging Machinery 3 (3) Systematic study of types of machinery used to form, fill, seal, and handle various packaging, products, and packaging materials. Emphasizes basic mechanical, electrical, pneumatic, and hydraulic components of packaging machinery along with packaging machinery terminology. Discusses methods for machine line optimization and layout. Preq: Packaging Science major or minor; and PKSC 2040; and one of PHYS 2060 or PHYS 2210.

PKSC 4030 Packaging Career Preparation 1 (1) Preparation for a successful career in Packaging Science by completing the professional portfolio and finalizing a resume and career e-portfolio. Refines career skills through role playing. Topics include presentations, interviewing, effective collaboration and communication, business and foreign travel etiquette. Preq: Packaging Science major or minor. Coreq: PKSC 4200.

PKSC 4040* Mechanical Properties of Packages and Principles of Protective Packaging 3 (3) Study of the mechanical properties of products and packages and standard methods of determining these properties. Focuses on the functional properties of packages related to shock and vibration isolation and compression. Includes Honors sections. Preq: Packaging Science major or minor and junior standing; and MATH 1060 and PKSC 2040; and one of PHYS 1220 or PHYS 2070.

PKSC (FDSC) 4090 Total Quality Management for the Food and Packaging Industries 3 (3) Introduction to the principles of modern quality management emphasizing quality standards and issues and the practices necessary for food processing and packaging companies to survive in a customer-driven marketplace. May also be offered as FDSC 4090.

PKSC 4160* Application of Polymers in Packaging 4 (3) Detailed study of polymer science and engineering as applied to packaging science. Includes polymer morphology, rheology, physical properties, processing methods, and polymerization. Emphasizes relationships among processing, structure, and properties. Preq: Packaging Science major or minor; and PKSC 2040 and PKSC 2060; and one of PHYS 1220 or PHYS 2070; and one of CH 2010 or CH 2230. Coreq: PKSC 4161.

PKSC 4161* Application of Polymers in Packaging Laboratory 0 (3) Non-credit laboratory to accompany PKSC 4160. Coreq: PKSC 4160.

PKSC 4200* Package Design and Development 3 (2) Study of the principles and methods practiced in designing and developing packages and packaging systems and of methods used to coordinate and analyze package development activities including interfacing with product development, manufacturing, marketing, purchasing, and accounting. Preq: Packaging Science major or minor and second semester senior standing; and PKSC 3200 and PKSC 3680 and PKSC 4400. Preq or concurrent enrollment: PKSC 4010 and PKSC 4040 and PKSC 4160 and PKSC 4300 and PKSC 4540 and PKSC 4640. Coreq: PKSC 4030 and PKSC 4201.

PKSC 4201* Package Design and Development Laboratory 0 (3) Non-credit laboratory to accompany PKSC 4200. Coreq: PKSC 4200.

PKSC 4210 Special Problems in Packaging Science 1-4 (1-4) Independent research investigations in packaging science related to packaging materials, machinery, design, and applications. Special emphasis is placed on organizing a research proposal, conducting research, and reporting results. May be repeated for a maximum of 15 credits. Preq: Consent of instructor.

PKSC 4220 Selected Topics in Packaging Science 1-3 (1-3) Comprehensive study of selected topics in packaging science not covered in detail or contained in other courses. Contemporary developments in each area are stressed. May be repeated for a maximum of 15 credits, but only if different topics are covered. Preq: Consent of instructor.

PKSC 4230 3D Parametric Design Online 3 (3) Provides an overview of the techniques used in designing 3D parametrics solid parts for packaging science applications. The course begins with a basic overview of design software and progresses to cover advanced applications, including simulation, surface, tooling, post-rendering and sustainability. Additionally, this course prepares students for a professional certification exam. Recommended for students who have experience with design software.

PKSC 4240* Structural Packaging Design Online 3 (3) Provides a comprehensive overview of how to design structural packaging for paperboard and corrugated mediums. This course begins with a basic overview and transitions into covering advanced applications. Access to design software (vector-based 2D CAD software, such as Illustrator or ArtiosCAD) is required. Recommended for students with design software experience.

PKSC 4300* Converting for Flexible Packaging 3 (1) Study of materials, methods, processes, and equipment used in converting web materials for flexible packaging. Laboratory provides hands-on experience preparing and operating pilot-scale converting equipment. Preq: Packaging Science major or minor; and PKSC 2040. Coreq: 4301.

PKSC 4301* Converting for Flexible Packaging Laboratory 0 (6) Non-credit laboratory to accompany PKSC 4300. Coreq: PKSC 4300.

PKSC 4400* Packaging for Distribution 3 (3) Packages are exposed to various shipping methods and numerous hazards during distribution. To ensure adequate product protection, packaging professionals need to understand the fundamental principles of distribution packaging design. Topics include ASTM and ISTA packaging test methods, packaging design guidelines for distribution, terminology, transport modes, distribution hazards, and protective packaging materials. Preq: Packaging Science major or minor; and PKSC 4040.

PKSC 4540* Product and Package Evaluation Laboratory 1 (3) Laboratory experiments to determine properties of packaging materials and to evaluate the response of packages and products to shock, vibration, and compression. Students operate standard testing equipment and become familiar with industry recognized test methods and standards. Preq: Packaging Science major or minor. Preq or concurrent enrollment: PKSC 4040.
PLPA 3020 Plant Pathology Research 1-3 (1-3) Methods and procedures used in the diagnosis of plant diseases, especially late spring and early summer diseases. Basic techniques of pure culture and identification of plant pathogens and Koch’s postulates are taught. Diagnosis of a wide variety of diseases of cultivated and wild plants is carried out. Offered summer session only. Preq: PLPA 3100. Coreq: PLPA 4111.

PLPA 4110* Plant Disease Diagnosis I Laboratory 0 (3) Non-credit laboratory to accompany PLPA 4110. Coreq: PLPA 4110.

PLPA 4111* Plant Disease Diagnosis I Laboratory 0 (3) Non-credit laboratory to accompany PLPA 4110. Coreq: PLPA 4110.

PLPA (ENT) 4060* Diseases and Insects of Turfgrasses 2 (2) Host-pest relationships, symptomatology, diagnosis, economics, and control of infectious diseases of turfgrasses and life histories, diagnosis, and control of important insect pests of turfgrasses. May also be offered as ENT 4060. Preq: ENT 3010 and PLPA 3100.

PLPA (ENT) 4080* Diseases and Insects of Turfgrasses Laboratory 1 (3) Laboratory to complement PLPA 4060 or ENT 4060 to learn symptomatology, diagnosis, and control of infectious diseases of turfgrasses and diagnosis of damage caused by important insect pests of turfgrasses. May also be offered as ENT 4080. Preq: PLPA 4060 or ENT 4060.

PLPA 4110* Plant Disease Diagnosis I 3 (3) Methods and procedures used in the diagnosis of plant diseases, especially late spring and early summer diseases. Basic techniques of pure culture and identification of plant pathogens and Koch’s postulates are taught. Diagnosis of a wide variety of diseases of cultivated and wild plants is carried out. Offered summer session only. Preq: PLPA 3100. Coreq: PLPA 4111.

PLPA 4111* Plant Disease Diagnosis I Laboratory 0 (3) Non-credit laboratory to accompany PLPA 4110. Coreq: PLPA 4110.

PLPA (BIOL) 4250 Introductory Mycology 3 (3) Introduction to the biology of all the groups of fungi and some related organisms, with considerations of the taxonomy, morphology, development, physiology, and ecology of representative forms. May also be offered as BIOL 4250. Preq: BIOL 1040 and BIOL 1060; or BIOL 1110. Preq or concurrent enrollment: BIOL 4260 or PLPA 4260.

PLPA (BIOL) 4260 Mycology Practicum 2 (1) Application of the principles of mycological techniques, microscopic study of fungi. Examples from all major groups of fungi are included. May also be offered as BIOL 4260. Preq or concurrent enrollment: BIOL 4250 or PLPA 4250. Coreq: PLPA 4261.

PLPA (BIOL) 4261* Mycology Practicum Laboratory 0 (2) Non-credit laboratory to accompany PLPA 4260. May also be offered as BIOL 4261. Coreq: PLPA 4260.

PLPA (BIOL) 4540* Plant Virology 4 (3) Study of plant viruses: their morphology, biochemistry, purification, and transmission; symptoms resulting from virus infection; virus vector relationships. Serological and nucleic acid hybridization procedures. Diagnosis of viral diseases and the identification of causal agents. Replication of plant viruses, the interaction between viral host and plant genome. Control of plant viral diseases. May also be offered as BIOL 4540. Preq: BCHM 3010 or BCHM 3050 or MIRC 3050. Coreq: PLPA 4541.

PLPA (BIOL) 4541* Plant Virusology Laboratory 0 (3) Non-credit laboratory to accompany PLPA 4540. May also be offered as BIOL 4541. Coreq: PLPA 4540.

PLPA 4590* Plant Nematology 3 (2) Introduction to nematodes emphasizing plant parasitic nematodes. Introduces morphology of nematodes as it relates to their taxonomic position and ability to cause diseases. Includes diagnosis and control of nematode diseases, along with use of nematodes in studies of molecular interaction and genetics involvement in developing resistance. Preq: PLPA 3100.